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to be continued

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MINNESOTA MEDICINE

Journal of the Minnesota State Medical Association, Southern Minnesota Medical Association, Northern Minnesota Medical Association, Minnesota Academy of Medicine and Minneapolis Surgical Society.

VOL. XVII MARCH, 1934 No. 3

THE PRESENT STATUS OF TREATMENT OF CARCINOMA OF THE BLADDER*

VIRGIL S. COUNSELLER, M.D.
Rochester, Minnesota

DIVERGENCE of opinion concerning the type of treatment to be applied to malignant tumors of the urinary bladder is due chiefly to the fact that there has been no standard classification as to type, and degree of malignancy of these tumors and no accepted plan for their surgical removal. However, in recent years the urologist has succeeded in perfecting diagnostic methods and transurethral surgical procedures so that now satisfactory information may be obtained concerning size, situation, type, and degree of malignancy, thereby making it possible to plan quite accurately the method of surgical treatment best suited to the individual case.

Electrocoagulation, radium, segmental resection and excision, and total cystectomy all have been employed in the treatment of malignant lesions of the bladder, but it is difficult to evaluate procedures except those in the hands of individual surgeons. Certain opinions may be obtained by comparing the results of various surgeons using the same technic, provided cases are accurately classified with regard to site of the lesion, degree of malignancy and extent of vesical involvement. Obviously the operation of choice by one surgeon may not be that of another. For instance, Corbus and O'Conner advocate destruction of the tumor by electrocoagulation; Barringer and Dean treat the tumors almost exclusively by radium, whereas Judd, Chute, Hunt, Beer and Bugbee advocate radical surgical removal of the lesions whenever advisable. André and Grandineau, at the French Urological Congress in Paris in 1932 expressed the general opinion that surgical removal gave the most favorable results and that radium, roentgen-rays and diathermy should be regarded as palliative measures in inoperable cases.

Corbus stated his belief that a particular method should be mastered, adhered to, and all others excluded. His favorable results with electrocoagulation lend some support to this contention, but I believe most surgeons will agree with Bugbee that the type of treatment should be determined by the condition found in the individual case; it may include radical excision, electrocoagulation, implantation of radium, or a combination of these procedures plus the possible use of high voltage roentgen rays postoperatively.

Factors which must be determined and which govern the type of treatment of carcinoma of the bladder are the size and situation of the lesion, and the type and degree of malignancy. It is the policy at The Mayo Clinic to apply the surgical procedures indicated after the foregoing factors have been ascertained. I shall, therefore, review briefly the salient points in establishing the diagnosis, and the surgical treatment in such cases.

DIAGNOSIS

The diagnosis of carcinoma of the bladder can be made accurately only by the aid of a cystoscope and microscopic examination of a specimen removed. Even this may fail if infection, which not infrequently complicates carcinoma, is extensive, and specimens removed may disclose inflammation only. In such cases it is wise to open the bladder from above for direct inspection and microscopic study of multiple areas rather than to continue to treat the bladder for cystitis. If carcinoma is coexistent with infection, it is usual-

*From the Division of Surgery, The Mayo Clinic, Rochester, Minnesota. Read before the meeting of The Minnesota Surgical Society at the annual meeting of the Minnesota State Medical Association, Rochester, Minnesota, May 22, 1933; also, before the meeting of The Northern Minnesota Medical Association, Willmar, Minnesota, September 8, 1933.

ly highly malignant and early treatment is urgent. Hematuria is the most common symptom of carcinoma of the bladder but is not diagnostic, since lesions of the kidney, ureter and prostate gland may present the same symptom. Hematuria associated with freqency and dysuria are quite significant, and complete cystoscopic examination is essential. Early and accurate diagnosis at the onset of symptoms is certainly one of the most important factors in reducing the high mortality rate and improving the end-results. Too many of these patients delay seeking medical advice and thereby materially reduce their chances for permanent cure. Hunt reviewed fifty-one cases in which the disease had advanced so far that it was not thought advisable to attempt any form of treatment. He found that the average duration of symptoms previous to the patients' admission to the clinic was almost two years. Disregarding the lesions which are amenable to transurethral electrocoagulation, he estimated the inoperability of the major malignant lesions at not less than 25 per cent. Bumpus found, in a review of 465 cases of tumor of the bladder treated by suprapubic exploration, that it was not possible or advisable to institute any form of treatment in sixty-six cases.

Obstruction in the median lobe of the prostate gland occasionally produces hematuria from congestion, but this should not mislead the observer since only a small proportion of such lesions bleed and not infrequently carcinoma of the bladder is associated with obstruction of the prostate gland. If hypertrophy of the prostate gland is present, cystoscopic examination is difficult, and the exact situation and size of the tumor may not be accurately determined.

If the diagnosis of infiltration of the wall of the bladder remains doubtful after cystoscopic examination, the cystogram usually will reveal a filling defect in the wall. But, as Kretschmer has pointed out, if the malignancy is principally in the periphery of a papilloma without much involvement of its pedicle, the cystogram might be negative. If the base of the tumor cannot be seen, it is not safe to estimate the operability of the growth, since it may fill the entire bladder and yet originate from a small pedicle without infiltration of its walls. Microscopic examination of specimens removed through the cystoscope gives accurate and final information as to the character of the tumor.

CLASSIFICATION AND GRADING OF TUMORS OF THE BLADDER

As has been stated, there is no uniform classification of tumors of the bladder nor is there agreement as to the degree of malignancy. Various observers, who have studied these tumors for many years, both clinically and pathologically, agree that they should be classified as follows: (1) papilloma graded 1, (2) papillary carcinoma, and (3) infiltrating carcinoma. Many observers, however, believe that the benignancy of the so-called papilloma of the bladder is only relative. Points of distinction are often difficult to evaluate and therefore the tumors are classified according to the experience of individual observers. A significant point in formulating an opinion regarding papillomas of the bladder, as Caylor has stated, is that some of them may implant themselves in other parts of the organ or in a suprapubic wound following an open operation, or they may recur locally, which is also a characteristic feature of epithelioma of the bladder. The fact that 95 per cent of all tumors of the bladder are epitheliomas is certainly significant, and suggests that the so-called papilloma is not far removed from a true epithelioma.

Broders, in 1920, presented a classification for grading the potential malignancy of epithelioma. He stated that a neoplasm can accomplish only what its cells can accomplish, and if these are active then the tumor is active. His classification is based on the degree of differentiation of cells. Broders asserts that by this differentiation the cells are able to check their own growth, which means that highly differentiated cells indicate low grade malignancy whereas undifferentiated cells indicate a high grade of malignancy. The variations in the degree of malignancy he designated by grades 1 to 4, the former being low and the latter high. Clinical experience with epitheliomas of the bladder as well as of other regions of the body in the last thirteen years in The Mayo Clinic conforms with that of Broders' classification of the degree of malignancy. In a considerable percentage of cases the urologist is able to estimate the degree of malignancy at cystoscopic examination from the gross appearance of the tumor. Tumors graded 3 or 4 frequently grow so rapidly that their blood supply is disturbed and they become necrotic. Because of the difference in rate of growth of epitheliomas of the bladder and the slight difference between the

so-called papilloma and the low grade papillary carcinoma as seen at The Mayo Clinic, I believe it wisest to consider all tumors of the bladder as potentially malignant and to treat them as such.

The situation of tumors of the bladder with respect to the lateral walls, dome, base and trigone, is significant with regard to the degree of malignancy. Apparently there is a tendency for the development of highly malignant epitheliomas in the base and for a less malignant growth on the lateral walls and dome. Hunt found in a series of 150 epitheliomas of the base that the incidence of a high degree of malignancy (graded 3 or 4) was 64.6 per cent, as opposed to 53.6 per cent of 214 epitheliomas of the lateral walls and dome.

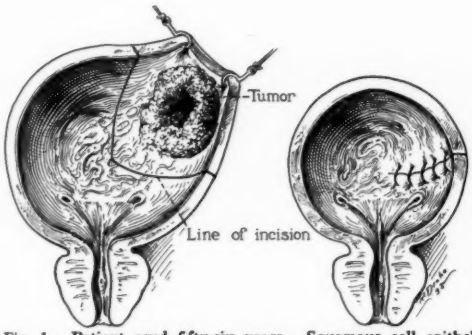

Fig. 1. Patient aged fifty-six years. Squamous cell epithelioma, graded 4. Dysuria, hematuria and cloudy urine had been present for one year. Segmental resection was done. Roentgen treatment for four hours after operation. Condition good at time of dismissal.

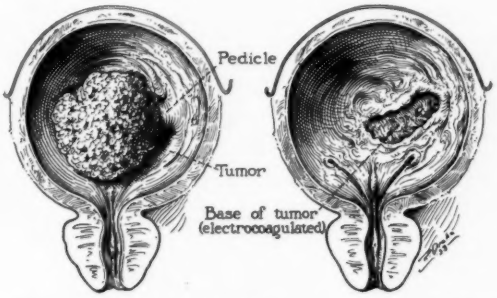

Fig. 2. Patient aged fifty-three years. Papillary squamous cell epithelioma, graded 3. Hematuria, nocturia and dysuria had been present for one year. Excision and electrocoagulation was done. Roentgen treatment for four hours after operation. Condition good at time of dismissal.

SURGICAL TREATMENT

Appropriate surgical treatment can be instituted only after the grade of malignancy, the size of the lesion and its situation have been determined. There are two avenues of approach, the transurethral and the suprapubic. At The Mayo Clinic it has been the practice when the tumor is comparatively small and the malignancy graded 1 to 2, to destroy the growth by transurethral electrocoagulation. However, with recent improvement in transurethral procedures small lesions, graded 3 or 4, that are easily visualized and which have not as yet infiltrated the wall of the bladder to a marked degree, have been treated in the same way. This method may be combined with the use of gold radon seeds. If such lesions can be treated successfully by this method, it is of distinct advantage since the risk is small and the period of hospitalization is shorter.

The more extensive highly malignant lesions and the widespread lesions of low grade malignancy are attacked by the suprapubic route, using segmental resection with disposition of the ureter when it is involved, excision, electrocoagulation, insertion of gold radon seeds or platinum-irridium needles, containing 1 mg. of radium sulphate (element), about 1 cm. apart around the margin of the lesion and across the electrocoagulated surface, and a combination of these procedures.

The highest percentage of operable lesions are in the dome and lateral walls, and therefore, are more suitable for segmental resection or local excision. If the lesion is graded 3 or 4, it is practically always of the infiltrating type and involves not only the wall of the bladder but the tissues adjacent to the bladder and the peritoneum. In such cases Judd advises opening the peritoneum so that the extent of the peritoneal involvement can be visualized and the lesion disposed of by segmental resection. Crenshaw has called attention to submucosal infiltration of highly malignant lesions, which in some instances is productive of bulbous edema around the margin of the tumor due to the disturbance of the vascular supply to the wall of the bladder. On this account, wide excision or resection should be performed with the cautery knife to include a margin of at least 1 cm. of normal vesical wall around the lesion (Fig. 1). Hunt reported a series of 214 cases in which the tumors were in this situation. Segmental resection was done in 114 cases with eleven deaths, a mortality of 10 per cent as opposed to seven deaths following various types of excision in 100 cases.

Excision is more applicable to tumors of low grade of malignancy since they are not usually infiltrating and seldom involve more than the mucosa. Frequently it is advisable to combine excision with electrocoagulation of the adjacent vesical wall, particularly if the site of attachment is unusually large, as further protection against local recurrence (Fig. 2).

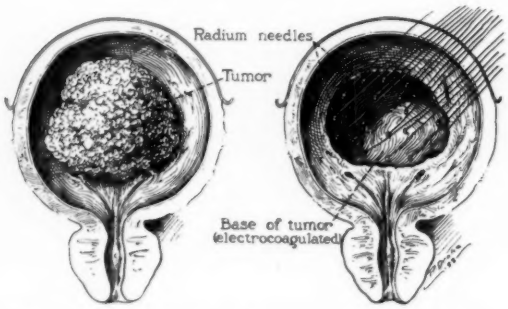

Fig. 3. Patient, aged sixty-four years. Papillary squamous cell epithelioma, graded 4. Dysuria, hematuria and low abdominal pain had been present for one month. Excision, electrocoagulation and insertion of radium needles equivalent to 816 mg. hours. Condition good at time of dismissal.

Lesions which involve the base of the bladder present the most difficult problem, and opinions differ widely as to the correct treatment. Many are inoperable at the time of examination. These are usually graded 3 or 4 and involve one or both ureters or the urethral meatus, and are of the infiltrating type. If segmental resection is to be done, the ureter must be disposed of either by ligation or reimplantation. In a series of fifty-two cases at The Mayo Clinic in which resection was done with ureteral ligation, the mortality was 13.4 per cent, whereas in forty-seven cases in which the ureter was reimplanted the mortality was 32 per cent. Beer gives a mortality of 21 per cent in thirty-seven cases with or without transplantation of the ureter, and 43 per cent recurrences. Because of the poor surgical results from resection, other methods have been employed in a larger number of cases.

Since the introduction of electrocoagulation by Beer in 1910, its use has been extended to treat not only the small lesions with low-grade malignancy, but those inoperable lesions of high-grade malignancy at the base of the bladder. Corbus applied electrocoagulation in experimental work on the bladders of dogs. He demonstrated that the capacity of the bladder was not reduced and the wall remained smooth and elastic as opposed to the irritating deformity sometimes seen following resection. He reported favorable results from its use in all situations in the bladder, and regards it as the surgical procedure of choice. It has been used in The Mayo Clinic since January, 1925, with satisfactory results, not only for small lesions of low-grade malignancy but for transvesical electrocoagulation of inoperable lesions

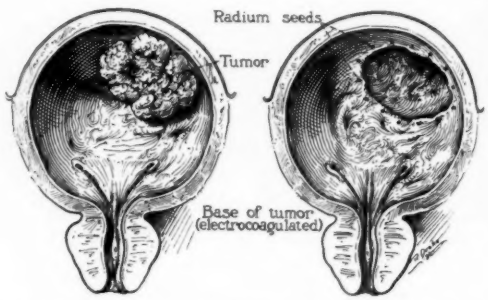

Fig. 4. Combination of excision, electrocoagulation and insertion of radium seeds.

of high-grade malignancy of the base of the bladder. In a recent study of 165 patients with malignant lesions of the bladder who lived five years or longer following various surgical procedures, I found that seventeen of the 165 lesions involved the base of the bladder and were considered nonresectable. The lesions were treated by electrocoagulation, and fifteen patients (88 per cent) are alive and free from vesical symptoms.

Electrocoagulation may be effectively combined with the use of radium needles, or seeds, particularly when lesions of high-grade malignancy have extensively infiltrated the base and trigone or the wall of the bladder and resection is not advisable (Figs. 3 and 4).

Barringer advises the use of radium alone as the most satisfactory treatment. He reported fifteen cases of papillary carcinoma in a series of twenty-three in which radium alone was used. The patients were free from symptoms of the disease, as opposed to eighteen patients in a series of sixty-one with infiltrating lesions. Certainly this is a commendable record and serves to emphasize the value of radium when properly applied in the treatment of malignant lesions of the bladder. Furthermore, since excellent results have been reported with electrocoagulation and radium separately, it would seem that even better results should be obtained by their combined use.

Barringer uses one gold seed of 2 millicurie to each square cubic millimeter of surface of the lesion. The papillary portion of the tumor should be removed by the cautery, then the radium accurately placed on the exposed surface of the bladder.

Total cystectomy for malignant lesions involving the base and trigone of the bladder has been recommended by Judd, Coffey, Chute and others, but the risk of the operation so greatly exceeds the chances of cure that its advisability hardly seems justified.

The best results should be secured when lesions are of a low grade of malignancy, without infection, but the chances of cure by electrocoagulation and radium in all grades and situations, considerably exceed total cystectomy and transplantation of the ureters, although Coffey reported several cases in which he performed, simultaneously, transplantation of the ureters into the sigmoid and total cystectomy successfully. Continued improvements in the technic may give more favorable results with this procedure. The degree of malignancy will never change, therefore it must be remembered that lesions graded 3 or 4 extend early and rapidly through the wall of the bladder and involve the perivesical tissues, including one or both ureters, the rectum, prostate gland and seminal vesicles.

RECURRENCES

Regardless of the method of removal, postoperative recurrence or extension of the malignant growth may take place in the form of implants, either before or after operation, or by direct extension beyond the tissue removed, or along the lymphatic vessels. In 1932 I studied cases of recurrence of tumor of the bladder according to the grade of malignancy. The percentage of recurrences of all grades of lesions was rather uniform. Sixty-seven patients had recurrences but had lived five years or more. Fifteen of the sixty-seven had recurrent growths graded 1; thirty-three had recurrent growths graded 2; eleven had recurrent growths graded 3; and four had recurrent growths graded 4. Recurrence after radical excision or electrocoagulation of a growth of low-grade malignancy is not so likely to occur as it is following the same procedure for a growth graded 3 or 4.

For many years at The Mayo Clinic all such patients have been requested to return in three months for a checkup on the condition of the bladder, then again in three months, then in six months and then in one year. If they are free from recurrences at the end of this period, they are dismissed from observation. In this manner many recurrent growths are discovered and destroyed by transurethral electrocoagulation before symptoms develop, thereby making it possible greatly to improve the end results. Unfortunately some patients disregard the follow-up note, and fail to return until there is extensive local recurrence requiring secondary transvesical surgical procedures. Of the group of sixty-seven patients who had recurrence and returned for check-up and treatment, 75 per cent are alive and free from symptoms referable to the bladder.

The end results in this disease will continue to improve if the surgical procedures applied are selected according to the degree of malignancy, the situation, and the extent of the lesion. Some form of follow-up system is essential if the recurrent growths are to be eliminated before they become extensive and inoperable.

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THE OPERABILITY OF TUMORS OF THE SPINAL CORD*

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TUMORS of the spinal cord are predominantly benign and operable. The symptoms are produced by compression of the cord within its bony canal and consist in motor and sensory changes below the site of compression. Symptoms can be relieved only by operation, and the extent and permanency of relief depends on the type and situation of the tumor encountered, as well as on the amount and duration of the compression. Early diagnosis and operation are followed by excellent clinical results, due to the fact that by far the greater number of tumors are not malignant and are removable.

Tumors compressing or involving the spinal cord may arise from the bony structures of the vertebral column or from any of the tissues surrounding or constituting the spinal cord (Table I).

For convenience, these tumors are divided into three classes according to their anatomic relations to the cord. Those which arise external to the meningeal coverings of the cord are designated as extrameningeal. Those which arise within the meninges but which do not invade the cord are called intrameningeal, and those which arise from the structures of, or within the cord are termed medullary.

*From the Section on Neurologic Surgery, The Mayo Clinic, Rochester, Minnesota. Read before the Society of Neurology and Psychiatry in conjunction with the annual meeting of the Minnesota State Medical Association, Rochester, Minnesota, May 22, 1933.

For the purpose of estimating operability, a series of 392 tumors of the spinal cord which have been completely or partially removed at The Mayo Clinic and which have been verified pathologically, has been reviewed. In a previous paper it has been emphasized that any type of tumor may occur at any level, and that no particular type is more frequently found in one portion than in another. It is interesting to note, also, that no particular segment shows any predilection for the development of tumors. The apparent preponderance of tumors in the thoracic segments is due to the relative length of the spinal cord in this region. The segmental level of tumors in the series studied was as follows: cervical, 13 per cent; cervicothoracic, 10 per cent; thoracic, 50 per cent; thoracolumbar, 10 per cent; lumbar, 13 per cent; lumbosacral, 3 per cent, and sacral, 1 per cent.

In the entire group of 392 tumors, ninety-seven, or 24 per cent, were found at operation to be external to the meninges and consequently were classified as extrameningeal. Of this group, only ten were metastatic, and examination of the pathologic diagnoses revealed that the majority of these tumors were benign and amenable to surgical removal. The pathologic diagnoses, and the number of tumors of each type were as follows: neurofibroma, twenty-four; fibrochondroma, ten; osteosarcoma, seven;

TABLE I. TUMORS OF THE SPINAL CORD AND THEIR ORIGIN

Origin		
Extrameningeal tissue	Vertebræ	Osteoma Chondroma Osteosarcoma Fibrochondroma Fibromyxochondroma Giant cell tumor Hypertrophic osteitis
	Extradural fat	Lipoma Lymphosarcoma Fibrosarcoma Hypernephroma Tuberculoma Fibroma (Metastasis)
	Spinal nerve	Neurofibroma
	Blood vessels	Hemangioma Hemangio-endothelioma
Intrameningeal tissue		Endothelioma Neurofibroma Hemangioma Fibrochondroma Fibroma Ependymoma (filum) Hemangio-endothelioma Varicosity
Medullary tissue		Glioma Ependymoma Hemangioma Fibroma Fibrolipoma Neurofibroma Sarcoma Carcinoma metastasis Cysts

hemangioma, six; hypertrophic osteitis, seven; myeloma, five; fibroma, six; hemangio-endothelioma, six; osteoma, three; giant cell tumor, four; tuberculoma, four; lymphosarcoma, four; fibrosarcoma (metastatic), five; hypernephroma (metastatic), two; carcinoma (metastatic), two, and glioma, two.

The largest and most important group of tumors are those which arise within the meninges and involve the spinal cord only by compression. Fifty-two per cent of the entire group of 392 tumors were found in this situation. A review of the pathologic characteristics of these tumors demonstrated that by far the greater majority of them were either endotheliomas or neurofibromas and that even the ependymomas were completely removable when encapsulated and confined to the filum terminale. Throughout this series the term endothelioma refers to the tumors which have been designated as arachnoid fibroblastomas, psammomas or leptomeningiomas, and the term neurofibroma to perineural fibroblastomas. The intrameningeal tumors, representing 205 cases, were classified as follows: endothelioma, ninety-five; neurofibroma, seventy-seven; hemangioma, eight; fibrochondroma, two; fibroma, four; ependymoma (filum), thirteen; hemangio-endothelioma, two, and varicosities, four.

In the two preceding groups the surgical problem was that of relieving the compression on the spinal cord without producing trauma to the already compressed cord. However, in the third, or medullary group of tumors, of which there are ninety, an entirely different surgical problem was encountered. Here we were dealing with pressure on the cord from within outwards, and before radical removal could be accomplished it was necessary further to traumatize the cord by incising it. With great care, the more benign type could be completely or partially removed, and when the more malignant types of tumor were encountered, the relief of compression was often followed by palliation of symptoms. In this group, tumors primary in the spinal cord predominated, and for the most part belonged to the group of gliomas. This complicated the prognosis in view of the fact

that even complete removal might be followed by recurrence. The ninety medullary tumors were classified as follows: glioma, thirty-seven; ependymoma, nineteen; hemangioma, seven; fibroma, six; carcinoma (metastatic), three; sarcoma, two; hemangio-endothelioma (complete removal), two; endothelioma, two; fibrolipoma, one; neurofibroma, four; and cysts, seven.

The danger incident to laminectomy depends primarily on the general condition of the patient. But regardless of age, sex, situation and type of tumor, as well as the general condition of the patient, the operative mortality in the last four years has been but 4 per cent. It is interesting to note that in the period previous to the last four years the mortality averaged 8 per cent. This earlier period included all of the cases which were encountered before the modern technic had been perfected, and also cases in which the condition had progressed to the point of extreme risk. The mortality among patients encountered in the last four years would seem to give a fairer estimate of the specific mortality for the group.

It is apparent that the majority of tumors of the spinal cord are capable of being removed at operation. However, it would seem only fair to include within the scope of operability not only removal of the tumor but relief of symptoms and resumption of normal function below the site of compression. Extreme compression over a comparatively short time does not preclude return of function; however, marked compression over a longer period of time influences the extent and rapidity of the return of function. Clinical observation following operation indicates that when loss of function is 25 per cent, it is usually recovered in three months; a 50 per cent loss requires from six to twelve months, a 75 per cent loss about eighteen months, while a total loss of function requires at least two years, and the injury to the cord may be so extensive that recovery will never take place. It is logical to suppose that long continued compression of the spinal cord produces interference with the blood supply and altered metabolism of the spinal cord, which, if allowed to persist, will produce permanent degenerative changes. In order to determine the nature of such changes, experiments were carried out on dogs in which the clinical progress of compression of the spinal cord by tumors was duplicated as nearly as possible with artificial tumors. The tumors were allowed to remain in place for such a time as was necessary for complete paralysis to take place, and after an interval, the tumors were removed. In one series, the paralysis cleared up, and in another, it persisted. The cords were examined, and if the symptoms had been relieved by the secondary operation, there was little evidence of degeneration, but if the paralysis had persisted, there was definite cystic degeneration within the spinal cord.

These experiments explained why symptoms tend to persist after spinal cord tumors have been removed, and why some spinal cords are permanently injured following long periods of compression, and why normal function is not restored after operation.

The operability of tumors of the spinal cord should also embrace the question of recurrence of tumors removed at operation. The tendency for recurrence of primary tumors incapable of being completely removed, malignant lesions either primary or metastatic, and benign lesions incompletely removed, is very evident. We were very much interested in reviewing the entire group of 392 cases to determine, if possible, the tendency of the removable benign lesions to recur. Five such cases were found and these consisted of four neurofibromas and one endothelioma.

The endotheliomas of the spinal cord are similar to the intracranial meningiomas, in that they have a base or attachment to the meninges. Because these tumors are benign, complete removal would be expected to prevent recurrence, but whenever some of the base is left behind, then a nucleus for re-formation remains, and in one case in which there was recurrence of an endothelioma this apparently was the cause.

A woman was operated on for an intrameningeal endothelioma which was found in the lower lumbar region and the base or attachment was very broad. No difficulty was encountered in complete removal, and the patient recovered and remained free of symptoms for about eighteen months. She returned for examination, and a second operation was performed, at which time recurrence was found at the same site, and the growth was much larger. Both tumors proved to be endotheliomas.

Neurofibromas are benign fibrous tumors and do not tend to recur unless some of the tumor tissue is not removed at the first operation. In the three cases in which there was recurrence, tumor tissue apparently was left behind, although at the time of operation the field appeared free from residue. The first case was that of a man aged thirty-eight years, who was found to have an extrameningeal neurofibroma in the upper thoracic region. The tumor seemed to be well isolated and was easily removed. He was perfectly well for one year, when symptoms developed which indicated recurrence. At the second operation, another neurofibroma, situated extrameningeally, was found at the previous site. When removal was attempted, extension through the intervertebral foramina was found and the portion outside the vertebral canal was as large as that within. The supposition is that at the time of the first operation there was a small, extravertebral portion, with a small connection simulating a nerve root. This emphasizes the necessity for very careful roentgenograms of the spinal column, because more than 40 per cent of neurofibromas of the spinal cord give evidence of erosion, and whenever a so-called dumb-bell neurofibroma is suspected, careful scrutiny of the roentgenograms might obviate the chance of missing a small, extravertebral portion. The second case of recurrence occurred in a man aged twenty-seven years, who was found to have a small, discrete, intrameningeal neurofibroma in the cervical region. It was completely removed, but, similar to the previous case, must have had a small attachment, with a small extrameningeal tumor, for, although the man was completely relieved of all symptoms after his operation, return of his trouble fifteen months afterwards indicated recurrence. At the second operation, a well defined extrameningeal neurofibroma was found, and was removed, since which time the patient has been free of symptoms. The third case was that of a young woman who came to the clinic one year after an operation elsewhere, for removal of an extrameningeal neurofibroma. A second tumor was removed and proved to be a neurofibroma situated external to the meninges. The next year a second recurrence necessitated another operation elsewhere, and the report was that of neurofibroma. When the patient's symptoms returned for a third time, she came back for her fourth operation and an extensive neurofibroma was found outside the meninges, extending through two intervertebral foramina, with a very small portion of the tumor outside the vertebral canal. Here again there must have been a small residue of tumor remaining at each operation, but in this particular case, there was no evidence of bony erosion in the roentgenogram. From our observations it would seem that recurrence is to be expected in the malignant types of tumor, but in the benign types and especially the prevailing endotheliomas and neurofibromas, recurrence takes place only when complete removal has not been effected. This may result when the meningeal attachment of the endotheliomas is not removed with the tumor, or when a small extension of a neurofibroma is overlooked and left behind at the time of operation.

CONCLUSIONS

The majority of the tumors of the spinal cord are benign and operable. They may arise from the tissues of the vertebral column, spinal canal, meninges, and spinal cord, at any segmental level. For convenience they are divided into extrameningeal, intrameningeal, and medullary types of tumors, depending on their position in regard to the spinal cord. Of 392 tumors of the spinal cord, 302 were extramedullary and involved the spinal cord only by compression. The remaining ninety were primarily in the cord although some few were benign in nature and were removed. The mortality for the entire group was 4 per cent.

Relief of symptoms depends on the amount and duration of compression, for long compression tends to bring about vascular and metabolic changes within the cord, producing permanent degenerative changes, which in turn prevent a return to normal. Recurrences appear whenever the tumor is malignant and incompletely removed, and in the more prevalent benign group of endotheliomas and neurofibromas, whenever the base of one and extensions of the other are not removed. The entire group of 392 cases of tumors of the spinal cord have been analyzed from the standpoint of operability.

FERTILITY AND STERILITY IN THE MENSTRUAL CYCLE*

WITH DEMONSTRATION OF A NEW SLIDE RULE

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IT is now fairly well established that menstruation occurs as the result of failure of the ovum to be fertilized. Once during each menstrual cycle in a normal woman a matured ovum is extruded from the ovary, completing what we call the process of ovulation. There has then developed in the woman a fitting home for a nine-months guest. The endometrium has regenerated and the corpus luteum develops in the ovary. This latter probably should be regarded as a gland of internal secretion. If the ovum becomes fertilized the corpus luteum persists all during pregnancy; if the ovum remains unfertilized, it degenerates and disappears and menstruation occurs again. The same process is repeated with each cycle.

The relationship between ovulation and menstruation, particularly as regards the time between the two processes, has given rise to much speculation and argument. Some investigators have believed that ovulation may occur any time during the menstrual cycle while others maintain there is a definite orderly sequence between the two. When we consider the order in all other manifestations in Nature and when we realize that the menses occur with practical regularity, it would seem strange indeed that two processes which are so intimately related should not bear a definite relation to each other in regard to time. In other words, if menstruation is the result of failure of fertilization, and death of the ovum, it would be inconsistent in Nature to have menstruation follow in three days one month and in nineteen days the next. In more recent years the most common conception is that ovulation occurs some time in the middle of the menstrual cycle.

MORE RECENT CONCEPTION OF FERTILITY AND STERILITY

Recently Knaus in Austria and Ogino in Japan, working independently, came to the conclusion that if an ovum is unfertilized it lives only a short time. Ogino states the ovum dies in a few hours. Knaus states that it cannot be impregnated after a few hours as it quickly develops an albuminous membrane which prevents entrance of the spermatozoa. They both agree that if the ovum is not fertilized within a few hours of ovulation menstruation will occur not sooner than twelve days or later than sixteen days and it will follow regularly in thirteen or fourteen days in a high percentage of cases.

Such being the case, the duration of life of the spermatozoa is the next problem for the consideration in determining the fertile period for conception in women. In regard to this question Knaus states that spermatozoa do not preserve their power of fecundation longer than two days; Ogino, not longer than three days (Fig. 1). In rare cases they may maintain their fecundity as long as eight days. Therefore, if ovulation occurs twelve to sixteen days before the next period and spermatozoa keep their power of fecundity not over three days except in the rare exceptional case, the time of fertility in women must be limited to the period between 12 to 19 days before the next menses. From this the following conclusions are reached:

1. The time of conception is usually the week which falls between the twelfth and nineteenth days before the following mensis (*i.e.*, five days ovulation period and the three days previous.)

2. Conception is rarely possible between the twentieth and twenty-fourth days before menstruation is expected (except in those unusual cases where spermatozoa remain viable for a longer time).

3. Conception is impossible during the eleven days before the menses are due.

PREVIOUS CONCEPTION OF FERTILITY AND STERILITY

In some species in the animal world, the period of fertility in the female is definitely recognized and understood. In certain female animals there is a rutting period or period of sexual activity. This is commonly referred to as the period of "heat." Physiologically this is the period during which the animal is ovulating. Consistent

*Read before the annual meeting of the Minnesota State Medical Association, Rochester, Minnesota, May 22, 1933.

with the order in Nature elsewhere this is the only period in which the female can be impregnated. In fact it is the only time in which the female will accept the male. Furthermore, attempts at artificial insemination at any other time are fruitless.

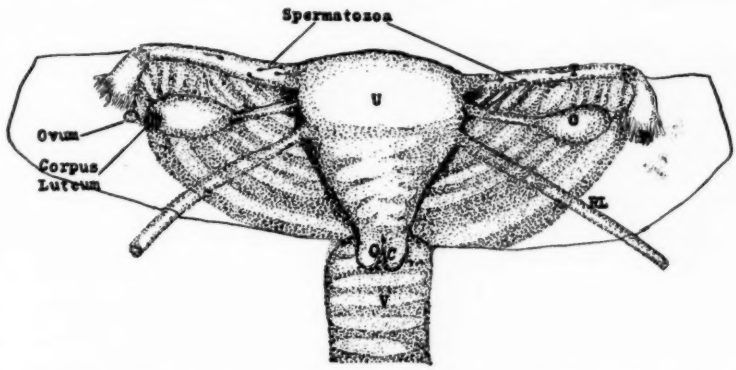

Fig. 1. Schematic sketch of ovum leaving the ovary. Spermatozoa already present in tubes waiting to impregnate the ovum.
Key: U—Uterus; T—Fallopian Tube; O—Ovary; RL—Round Ligament; OC—Cervix; V—Vagina; F—Fimbria.

A common mistake of only a few years ago was the parallel drawn between the rutting or period of "heat" in animals and the menstrual period in women. Nothing is more diametrically opposite. The rutting time in animals is the period of ovulation while the menstrual period in women represents the funeral obsequies of an ovum which has failed to become impregnated. Naturally women were advised that just preceding and just following their menses were their most fertile days and that the interval in the middle of the cycle was the relatively sterile period. Is it any wonder, in the light of our present knowledge of the time of ovulation, that failure rewarded our advice as to the sterile period in the menstrual cycle? The repeated failures following the old dictum lead to the widespread belief that at no time in the menstrual cycle is a woman sterile. With this new conception, it is possible that the converse will be true both as to the sterile and fertile periods.

There is already corroborating evidence that the ideas of Knaus and Ogino are correct. It is a religious tenet among the orthodox Jews that a woman is unclean for fourteen days after the beginning of her period and it is unlawful to have sexual relations during this time. The resumption of relations, therefore, occurred just at the time of ovulation and to this is ascribed the prolific character of the Jewish race. On the other hand, in the German army husbands were granted furloughs twenty days after the beginning of their wife's period, or eight to ten days before the next period was due. Only one pregnancy resulted after 400 such furloughs.

THE PRACTICAL SIGNIFICANCE

The practical significance of this newer conception is far reaching. People desiring children can regulate their sexual activities to the fertile period when conception is probable. On the other hand, peoples whose religious beliefs prevent the use of contraceptives can now regulate their sexual activity to the sterile period and abstain during the fertile period. No religious sect teaches that the size of one's family cannot be regulated by abstinence from sexual relations either entirely or during any part of the menstrual cycle. Again people who have no religious scruples against the use of contraceptives but possess a personal aversion to them can determine the time in the cycle when contraceptives are not necessary.

Latz recently in a monograph, The Rhythm, based on the work of Knaus and Ogino gave a very lucid presentation of the problem of fertility and sterility in the menstrual cycle. He charted many different types of cycles and indicated just which days a woman was liable to conceive. Although the work is very plain and intelligent to physicians, it is a bit confusing to the average lay person who possesses no back-

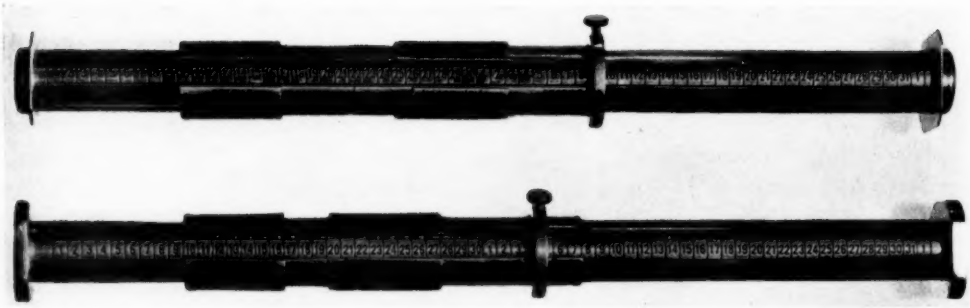

Fig. 2. Two views of the slide rule.

In the upper figure the rule is set for a woman with a thirty day cycle who may be at times as irregular as three days. It is locked at a point on the tenth day of a thirty day month (April, June, September, November) which is the first day of her period.

In the lower figure it is set for a woman who has a twenty-eight day cycle who is perfectly regular. It is also locked at a point on the tenth day of a thirty day month (April, June, September, November) which is the first day of her period.

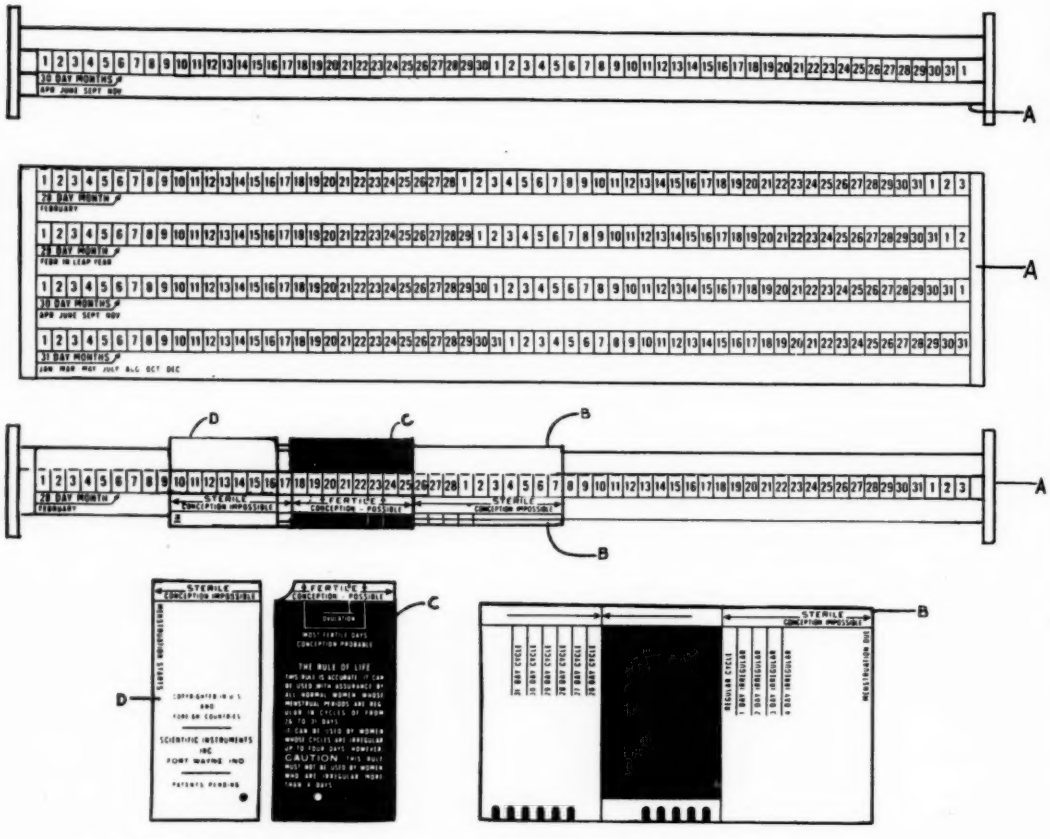

Fig. 3. Prints made from slide rule.
A. Slide rule showing calendars for twenty-eight, twenty-nine, thirty and thirty-one day months.
B. Carriage of slide rule for setting instrument on date in the month desired.
C. Movable sliding portion which is adjustable to fit the five variations in cycles in different women.
D. Movable sliding portion which is adjustable to fit the cycle in women.

ground in the physiological conception of pregnancy.

DESCRIPTION OF A NEW SLIDE RULE

In an attempt to simplify and accurately denote the time of fertility and sterility a slide rule has been developed (Figs. 2 and 3). This rule is a simple guide which can be adjusted to coincide with the menstrual cycle of most women. It tells at a glance the days when conception is probable, possible or impossible. Although, physiologically the time of fertility is limited to four days, on the slide rule this period is placed at eight days in order to make the instrument more dependable. If abstinence is practiced during the period marked "fertile" on the rule pregnancy is impossible in practically all cases. The only exception would be in the case where the spermatozoa remained viable and fecund longer than 3 days. On the other hand, people desiring children can facilitate conception by having relations on the dates marked fertile.

The rule is set to accommodate the peculiarities of the menstrual cycle in each individual woman. For example, it is set at the twenty-eight day mark for a women with a twenty-eight day cycle, or at the twenty-six or thirty day mark for women with a twenty-six or thirty day cycle. It can only be used by women whose cycles are between twenty-six and thirty-one days. The rule is cylindrical and has etched upon the shaft the calendars of a twenty-eight, twenty-nine, thirty and thirty-one day month. After the instrument is set to coincide with the cycle peculiar to the individual, the carriage of the rule is rotated to the month in question. For example, if the month happens to be May, it is rotated to the thirty-one day month calendar. Then the left edge of the carriage is placed to coincide with the first day of the woman's last period. Then by reading along the margin of the rule, the person can tell immediately just which days she is fertile and which she is sterile. However, some women are not absolutely regular. Their cycle may usually be twenty-eight days but occasionally they may delay two or three days. There is placed on the rule a second sliding portion to meet the needs of women whose cycles are irregular up to four days. By adjusting the second sliding portion as the case demands to the one, two, three or four days irregular marks, the fertile period is lengthened to accommodate for this irregularity. For example, if a woman usually has a twenty-eight day cycle but occasionally is two days irregular, adjust the left side sliding portion to the twenty-eight day cycle mark, adjust the second right side sliding portion to the two day irregular mark, and then if her period begins today, May 22, move the carriage to the date 22 in the thirty-one day month. Then lock the rule. It is now set for this particular woman for one month and it does not have to be touched until her June period begins.

EXCEPTIONS

This rule of course applies only to women who have cycles from twenty-six to thirty-one days and who are not more than four days irregular. It should not be used by any women whose periods do not fall within these limits. However, it is possible to develop slide rules which will fit their personal peculiarities. Occasionally illness, emotional strain, severe shocks, injuries, or extreme exhaustion may delay the time of ovulation and hence delay menstruation. At such times the rule should not be followed as it may not be reliable. The patient should wait until the cycle of her periods is reëstablished. After a pregnancy and lactation, the rule should not be used until her cycle has become regular again.

SUMMARY

1. There is a definite time relation between ovulation and menstruation.

2. The ovum is capable of fertilization only for a few hours.

3. Ovulation occurs twelve to sixteen days before the appearance of the next menstruation; in most cases thirteen to fourteen days.

4. Spermatozoa, except in rare cases, remain fecund not longer than three days.

5. There is, therefore, a fertile and a sterile period in a woman's menstrual period.

6. The period of fertility lies between the twelfth and nineteenth days preceding the next menstrual period.

7. A slide rule has been developed which graphically shows which days are fertile and which days are sterile in normal women.

8. This rule is applicable only to women whose menstrual cycle is between twenty-six and thirty-one days and who are not more than four days irregular.

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THE RÔLE OF THE SOFT TISSUES IN THE DIAGNOSIS AND TREATMENT OF BACK INJURIES*

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THERE is probably no field in industrial surgery in which the results of treatment vary so much as in that bugbear of the insurance company, of the railroad company, and I might say, of that field of general practice in which relief of back pain is sought. I have some hesitation in coming before you to express ideas which I know are in some measure antagonistic to those of the old school and which at first glance may appear to be a return to the empirical methods of my forefathers. Only the other day a colleague stated that my Welsh ancestry was evident in my ideas regarding the treatment of low back strains. For long the profession has been at a loss to explain, or at least, has sat back in smug complacency and refused to recognize the good results which we must admit are frequent, in the treatment of many of these low back complaints by the manipulative charlatan. I would recommend to all of you a perusal of an article appearing in the January, 1930, number of the Journal of Bone and Joint Surgery, on the "Manipulation of Joints," by Clarence H. Heyman, of Cleveland.[6]

The profession must awaken to the fact that there is a place for the consideration of manipulative treatment in joint disabilities. It is my feeling, however, that the necessity for manipulative treatment has arisen in large measure because of our failure to understand the fundamental pathology in traumatic lesions about the joints and particularly those changes occurring in the back. The charlatan treats these cases in ignorance of the pathology and on wrong premises. We need not, and can approach these cases with an intelligent and logical viewpoint.

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Traumatic injuries of the back, excepting those associated with gross demonstrable fractures and dislocations, resolve themselves into periarticular tissue injuries about the joints and lesions of the muscles and fascias intimately associated therewith. Pain is a reflex due to irritative factors, traumatic or infectious. In the case of poor posture, pain is almost invariably a result of muscular strain. In the well balanced type of individual every segment of the back lies well supported upon the next lower segment. At all points the center of gravity is well supported in balance. In that type in which there is an approach to the horizontally placed sacrum causing an increased angulation at the lumbosacral joint, an increase in the lordosis may be a factor in muscle strain and the poorly balanced lumbosacral articulation may produce ligamentous strains. Imagine, if you will, the multitude of painful stimuli which originate at this area and you have the symptoms of backache. But that is not all, a vicious circle is started. The sufferer is constantly tired, has lowered reserve and lessened muscle tone and the underlying pathology is aggravated. Anomalies of the back occur frequently in this region and for the most part are deviations from the normal mode in the development of the transverse articulations of the fifth lumbar and first sacral vertebræ and incomplete development of neural arches. Willis,[8] of Western Reserve, has pointed out the frequency of these anomalies and Brackett,[1] of Boston, in an article in the Journal of Bone and Joint Surgery, read before the joint meeting of the British and American Orthopedic Associations, has stressed the fact that disabilities influenced by such anomalies are for the most part, soft tissue strain. Dr. Myron Henry,[5] some years ago, and Dr. Meyerding,[7] have elucidated, I believe, to every member of the profession in the Northwest, that anomaly called spondylolisthesis, in which an actual dislocation of a vertebra takes place at this site. Anterior-posterior and lateral x-ray views should be taken in every case of low back complaint and careful evaluation of the findings should be made; but let me warn you that in viewing an x-ray of this region you must not forget the soft tissue involvement. An investigation of the tensile strength and elasticity of fascia lata sutures shows that its elasticity and tensile strength is directly proportional to its cross-section area.[4] When one realizes that the fasciculi surrounding the muscle bundles of the low back region are relatively small and short, one appreciates that undue strain placed upon them readily results in tears of the fascia, usually at the site of its insertion upon the bony structures. The frequent finding of localized areas of tenderness, apparently within the soft tissue, should lead one to suspect the frequency of rupture of small muscle fibers. Traumatic soft tissue lesions result in localized hematomata which are resolved with the formation of scar tissue; and scar tissue within these muscle bundles is necessarily relatively inelastic. Early mobilization, as soon as organization has occurred, is indicated to preserve elasticity.

THE INDUSTRIAL BACK

In presenting this phase of my paper it is necessary, for clarity, to speak briefly of arthritis. From the multitude of types described, two main types are evident, hypertrophic and atrophic, representing bone and joint reactions to infection or toxemia. A consideration of these types is not essential to the present discussion but I wish to briefly point out that these are end-result entities and in the early stages, especially in the spine, are often unrecognizable, so that the occurrence of a painful back in the absence of demonstrable arthritis does not preclude arthritis, especially that type of plastic arthritis commonly ascribed to infectious origin and attacking the transverse articulations. The evidence of a careful history and a general physical examination are more reliable criteria at this early stage. Conversely, the presence of true arthritic changes does not argue against an "industrial back" but perhaps renders the subject more liable, and treatment should be cognizant of the close association of one with the other. If we strip the skin and superficial fascia off the back and with an x-ray eye consider the underlying structures we are amazed at the innumerable short muscle fibres, overlying, intertwining, and criss-crossing from ilium to process, process to spine, here, there and everywhere—literally thousands of them. And further, ligaments of almost equal number, capsules of transverse articulations, fascial expansions, dural prolongations along nerve roots, and then the comparatively simple and sturdy vertebræ under all, and yet most intimately a part of the whole. And nearby the sacroiliac joints, simpler and infinitely sturdier than any of the other joints.

Let me digress for a moment at this point. I believe there is such a thing as sacroiliac subluxation or, at least subluxation somewhere in the lumbosacroiliac region. I do not believe it is as frequent as stated by some.[7] I recall two positive roentgenograms of rotary subluxation. One case ossified completely and the other was relieved by manipulation. I have several cases relieved by manipulation in which the x-rays were negative but I cannot convince myself that these were subluxations. Rather, I guess that they were snapping ligaments, taut muscle fibers or pinched tissues relieved by manipulation. I recognize the possibility but not the probability. For diagnosis of sacroiliac strain I require the following criteria:

1. Previously negative history for arthritis or subacute infection substantiated by negative findings on general examination.
2. Sudden onset.
3. Excruciating, persistent, localized pain.
4. Pain radiation, if any, down the sciatic nerve. (Not lateral or anterior femoral cutaneous as these arise high in the lumbar plexus.)
5. Relief, at least transient, by manipulation.
6. Recurrence as above.
7. Positive Gænslen sign (Lovett, Goldthwaite and Lærrec signs are misleading.)

But what should impress one most in such a mental dissection is not sturdy bone but rather soft tissue, and this must be considered primarily in the diagnosis and treatment of these conditions. In the absence of positive clinical evidence of arthritis or x-ray evidence of causative anomaly or injury to bone structure, the condition usually resolves itself into one of soft tissue injury. The treatment is that of all periarticular injury. Early rest and support to allow organization to occur and acute pain to subside, followed in a few days, depending on the extent of injury and the patient's athletic development, by the restoration of function. And this I stress, *restoration of function* by heat, massage and exercise. The prolonged splinting of these backs by rest, strapping or braces is detrimental to good results, an economic waste and tends to make confirmed invalids, too often called malingerers though the fault lies with the profession.

These injured backs are susceptible to arthritis, so every possible focus of infection should be searched and treated, especially the bowels and prostate. It is this group which makes up such a large percentage of back cases in the Veterans' Bureau.

In case the back has continued beyond the acute stage and mobilization is proceeding too slowly, the forceful manipulation of the back in all directions will mobilize it and reproduce the original injury, from which point proper treatment can be instituted. In these cases, especially the old chronic rigid types, I always carefully rule out arthritis. Many of these backs, once injured, are peculiarly susceptible to repeated strains.

CONCLUSIONS

The normal function of the spine depends primarily upon balance and secondarily upon the physical development of the supporting soft tissues. The least change in this balance calls for compensation which, if adequate and normal to the component parts, will not cause complaint. Though compensation be adequate, the reserve ability to react normally to strain is frequently lowered by alteration in the balance or physical status of the parts. Treatment should be directed to a restoration of the physical support with particular stress laid upon soft tissue rehabilitation. A careful evaluation of the factors at play in producing the back complaints must be made with the realization that clinically the manifestations are soft tissue lesions, in a few cases aggravated wholly or in part by anomalies or associated arthritis. X-rays are of paramount importance in evaluating these conditions but a keen judgment is necessary lest one attach too much importance to its findings. I believe that the restoration of function in the soft tissue should be attempted as early as possible. Otherwise, supporting belts or braces may be necessary to fix the part and prevent recurrence of symptoms. Surgical intervention in certain types is indicated but I believe that many of our spine fusions in the past have been done because the general profession failed to recognize the soft tissues in their treatment of these conditions and surgery became necessary as a mechanical support.

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GENERAL PARESIS

A BRIEF CONSIDERATION OF ITS RECOGNITION AND TREATMENT

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WITHIN recent years, the prognosis of general paresis in the adult has been favorably influenced. Three factors are chiefly responsible for this: more adequate treatment of early syphilis; greater accuracy in the recognition of pre-paresis and early paresis; and the use of fever therapy. This presentation is made for the purpose of bringing these matters more directly to the attention of those whose work is essentially in other fields than syphilology or neuro-psychiatry.

General paresis (dementia paralytica) is an organic psychosis, chronic in its course.

Previous to the discovery of the spirocheta pallida by Schaudinn, reported with Hoffman in 1905,[18] many theories were advanced as to the cause of this disease. Mickle,[10] in 1886, listed such causes as sun-stroke, religious excitement, and masturbation. In classifying 4,284 cases diagnosed general paralysis of the insane, 991 were listed as "cause unknown" and only forty-one were indicated as due to "venereal disease." Today, it is universally acknowledged that the spirocheta pallida is the primary etiologic agent in general paresis.

Pathological examinations reveal the organic basis upon which the clinical findings rest. Both grossly and microscopically, the chief changes are noted in the fronto-parietal region. The dura is often tightly adherent to the skull and pachymeningitis hemorrhagica is frequently present. The pia-arachnoid is grayish, thickened and frequently so adherent to the cortex that upon stripping it off, decortication occurs. The convolutions, particularly anteriorly, appear shrunken. In the widened sulci a turbid fluid is noted. Section shows cortical atrophy, dilated ventricles, and occasionally infarcted areas. Microscopically, inflammatory changes are noted in the leptomeninges, plasma cell and lymphocytic infiltration being present. The cortex shows changes in both the vascular and nervous tissues. There are fewer ganglion cells, and those present show various types of degeneration, while the glial tissue is increased. Perivascular infiltration, especially with plasma cells, and new vessel formation, are exhibited. Again these alterations are noted chiefly in the anterior cortical regions, but may be seen less extensively in scattered areas elsewhere in the brain or even the spinal cord.

The onset of symptoms in this disease is from thirty to fifty-five years of age, as a rule about ten to fifteen years after the initial infection. Some cases, however, are reported, in which the chancre preceded the general paresis by a year or even less, and others in which paresis occurred after a delay of more than thirty years. It should be noted, in contradistinction, that so-called cerebrospinal or meningeovascular syphilis, as a rule, makes its appearance some two to five years after lues has been contracted.

It has been emphasized, and rightfully so, that in from 40 to 60 per cent of secondary luetics, and in about 10 per cent of those in the primary stage, there is an invasion of the central nervous system, as indicated by abnormalities in the cerebro-spinal fluid. These changes are usually in the form of pleocytosis (increase of lymphocytes) and a slightly positive globulin reaction, although at times a positive Wassermann or col-

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loidal gold changes are noted. Despite this early nervous involvement, only a moderate percentage of luetics develop late neurosyphilis, and only a portion of these general paralysis. Off hand, this would seem to indicate that paresis is not very common. Such is not the case, for about 12 per cent of all mental patients in institutions are cases of insanity due to syphilis, most of which are instances of general paresis.

Several factors may be active in preventing a greater number of tertiary neurolues from occurring, despite the great incidence of early neuraxis involvement. Even granting the existence of a neurotropic strain of spirocheta pallida, the production of immunity reactions must be the chief preventive mechanism. The knowledge that males are affected by paresis[4] about three times as frequently as females led to investigation of the effect of pregnancy upon the development of neurosyphilis. The work of Moore[11] and of Solomon[16] indicates that gestation is an important preventive mechanism in women. Again Mattauschek and Pilcz,[8] who made an analysis of the case histories of over 4,000 syphilitic Austrian army officers, pointed out that those who during the first year of their syphilis suffered from an acute febrile disease, did not develop late central nervous system syphilis, while almost invariably those who later exhibited neurolues did not have a febrile disease early in the course of their syphilis. The greatest importance of this observation is the suggestion and support it gave to the use of fever therapy as a preventive measure.

Next to immune reactions, adequate treatment, undoubtedly, plays the greatest rôle in reducing the incidence of paresis. The usual treatment in the early stages of syphilis is chemotherapy, chiefly arsenic, bismuth and mercury. More recently fever therapy, in the form of malaria, has been used as a preventive.

Too much emphasis cannot be placed upon the importance of the early recognition of general paresis. It is obvious that once parenchymal degeneration has progressed to any great degree, the opportunities of producing a remission or so-called "cure" are greatly diminished. Ferraro[3] found that after malaria treatment there is no distinct parallelism between the clinical findings and pathological changes, yet the guiding principle should always be early recognition. The shorter the duration of active disease, the less the brain damage, though one case may progress faster than another, and mild symptoms clinically may be associated with severe tissue injury. Reports of large groups of patients treated by various methods show, as a rule, that the sooner treatment is instituted after the appearance of symptoms, the better the results.

The economic and social rewards yielded the patient, and more particularly his family, from early diagnosis, are frequently immeasurable. These considerations, plus the benefit to the family from a health standpoint, are sufficient to demand such recognition.

Many who are not in frequent contact with general paralysis are prone to think of it as seen in its more advanced forms. For this reason, I shall consider, particularly, the means of its identification in its earlier stages.

Because of the frequency of early central nervous system involvement, it is absolutely essential that every patient with syphilis have periodic examinations of the cerebrospinal fluid over a period of at least five years. These check-ups should be made at least once every six months. The apparent segregation of the neuraxis makes this the more obligatory, for a negative blood Wassermann by no means assures a like finding in the spinal fluid. By such routine periodic examinations many cases of asymptomatic neurosyphilis may be found—that is to say patients in whom there are no signs of clinical involvement of the central nervous system, but in whom pathological findings are present in the cerebrospinal fluid. These cases of asymptomatic neurolues may be detected in the secondary or even the primary stage of the disease, as well as in the so-called latent phase between the secondary and the manifest tertiary stages. Moore and Hopkins[12] have reported a thorough study of 123 such cases.

A certain group of these patients will show the paretic formula in the spinal fluid, *i.e.*, increased cell count (usually), positive globulin, positive Wassermann, and the paretic type of colloidal gold curve as typified by 5555432100, as contrasted with the luetic curve as typified by the changes 0123343220. Certain of these individuals will go on to paresis despite therapy, but energetic treatment should be instituted immediately in an attempt to prevent its occurrence. These cases cannot be definitely diagnosed at this stage as paresis, but must be followed closely so

that if signs of general paralysis do occur, they will be recognized immediately.

When the stage of early paresis develops, it is often mistaken for a functional nervous condition, particularly neurasthenia or simple depression. To avoid this pitfall, thorough history taking, careful neuropsychiatric examinations, and serological studies are necessary. The early complaints are often chiefly of a somatic nature; aches and pains about the body, gastric distress, general ill feeling and the like. Possibly some difficulty in concentration will be complained of spontaneously, but seldom does the patient bring out mental changes. The history must make inquiry as to gonorrhea as well as syphilis, for the former often masks the latter. A negative venereal history means nothing, but a positive one is of value. Change in character or personality should be sought, not alone from the patient but also from his family and friends. It is well known that a history of laxness of morals, inattention to business, decrease in efficiency and some failure in judgment is often to be elicited in the early or prodromal stage of paresis. Symptoms such as headache, vertigo, failing vision and unsteadiness on the feet, especially while walking in the dark, are significant.

The neurological examination often reveals pupillary changes—inequality and irregularity, as well as the better known loss of light reflex, with preservation of accommodation reaction—the so-called Argyll-Robertson phenomenon. Tremor of the mouth and tongue and speech disturbance are commonly noted. There is often a partial ironing out of the naso-labial folds, giving the patient the appearance of being younger than his actual age. The knee-jerks may be exaggerated, absent or unequal. The general appearance is that of one below par. The mental changes now may be indicated by less care about the personal appearance, beginning memory defects, difficulty in concentration, and moral laxness, particularly significant if noticeably foreign to the individual's previous behavior.

Great emphasis must be placed upon the serological studies. A positive blood Wassermann is found in almost all cases, and the paretic formula is almost invariably found in the cerebrospinal fluid. The spinal fluid must always be examined whether the blood be positive or negative. The colloidal gold curve aids in differentiating general paresis from cerebral lues of the meningovascular type, and the other reactions help in determining the activity of the process.

The early stage passes into the second period or the stage of the fully developed disease. We now find an increase in all the above symptoms and findings. The general physical condition is poorer, as is evidenced by muscular weakness and increase in tremors, although body weight may be normal. Paretic seizures occur, which are apoplectiform or epileptiform in character. Occasionally, a true apoplexy occurs in general paralysis. There is difficulty in articulation, syllables are left out, duplicated or transposed; a like condition is noted in the handwriting.

According to the predominating mental symptoms, four types are now described. In the demented type the already present dementia increases. Failure of memory is pronounced, disorientation as to time, person and place occurs, and simple calculation, (*e.g.*, subtracting 7 from 100 serially), is impossible.

The expansive type consists of overactivity and grandiose delusions, superimposed upon the background of dementia described above. In some instances, delusions of persecution are found. These delusions are loosely strung together. This is the so-called classical paresis, the patient claiimng to be of extreme wealth, great strength, or some famous current or past person. Insomnia exists.

In the agitated type, the motor hyperactivity is still more marked. These patients are usually incoherent, express quickly changing delusions, are extremely restless and may go on to emaciation and exhaustion. Finally, the depressed type is often mistaken for involutional melancholia. However, in paresis, signs of underlying dementia and physical and serological findings of syphilis are present. Delusions of unworthiness are very common, as are those of a somatic nature—*e.g.*, the bowels have rotted away, certain organs are missing, and the like.

Remissions, either spontaneous, or therapeutically induced, may occur during the first two stages of paresis proper. Serologically, the paretic formula is present, unless altered by treatment.

Except in case of remission or death, the paretic gradually passes into the terminal period. There is a marked down-hill progression physically, the patient becoming emaciated, incontinent, bed-ridden and subject to frequent paretic

seizures. Mentally, profound dementia occurs—all mental powers are in abeyance, the individual leading practically a vegetative existence. Either death gradually ensues, or the patient is mercifully swept away by intercurrent disease.

Immediately upon determining that the patient is potentially or actually a case of general paresis, treatment must be instituted. Methods vary not according to the patient's physical or mental condition, but to the facilities available for his care as well. However, certain general principles of treatment may be outlined. The ideal for which everyone is working is prevention of the development of paresis. This goal may never be attained, but much can be done to approach it. The prevention of this disease (and other forms of tertiary lues) should begin the moment syphilis has been diagnosed. That is to say, intensive therapy must be instituted in the early stages rather than delayed until manifest tertiary phenomena have appeared.

Two major types of treatment for syphilis are available: chemotherapy and fever therapy. The former is often spoken of as specific, and the latter as nonspecific treatment. Arsenic, in the form of arsphenamine, neo-arsphenamine, sulpharsphenamine and tryparsamide; bismuth as its various salts in suspension or in aqueous solution; mercury, chiefly as the salicylate; and combinations of the metals, as bismarsen and silver arsphenamine, constitute the chief agents used in so-called specific treatment. Iodides are also used. Malaria, soduku (rat bite fever), relapsing fever, foreign proteins (chiefly typhoid vaccine), sulfosin and diathermy are the most important agents or non-specific or fever therapy.

The administration of what I consider the most effective forms of therapy will be considered briefly, following which the treatment most suited to given phases of the disease will be indicated.

I feel that neoarsphenamine and bismuth is the most generally useful form of specific therapy, unless general paresis is present, in which case I prefer tryparsamide. In neurosyphilis, we combine spinal drainage with the intravenous medication. A course of treatment of this type would consist of weekly intravenous injection of neo-arsphenamine 0.6 gram, or tryparsamide two to three grams, followed immediately in cases of neurolues by spinal drainage. Bismuth salicylate, grains two, in oil, or a soluble bismuth salt in equivalent dosage is given intramuscularly twice weekly. Each course should run for eight to twelve weeks, depending upon the tolerance of the individual. Arsenic intoxication must be watched for. In the use of tryparsamide, the eye-grounds must be carefully inspected before treatment is begun, and frequently during the course as well, for a toxic amblyopia may occur. Following each series of injections a rest interval of six to eight weeks should be allowed before a new course is instituted. The number of courses to be given depends upon the response of the individual patient. This response is judged by the clinical condition and the serological findings of the cerebro-spinal fluid, as well as of the blood.

It is said that the favorable effect of fever upon certain psychoses was known to Hippocrates, but it was not until between 1860 and 1870 that a febrile disease was voluntarily produced in psychotic patients for its curative effects.[1] At that time, Dr. Rosenblum, of Odessa, inoculated the organisms of relapsing fever, malaria and typhoid fever into individuals suffering from general paresis. However, general interest was not aroused until in 1917, when Wagner von Jauregg infected a number of paretics with malaria and noted excellent results following such treatment. Since that time, the production of therapeutic fever in neurosyphilis has been introduced by various agents, as follows: by relapsing fever (Plant and Steiner),[14] 1920; by soduku (Solomon, Berk, Theiler and Clay),[17] 1926; by intravenous typhoid vaccine (Kunde, Hall and Gerty),[7] 1927; by hot baths (Mehrtens and Pouppirt),[9] 1929; and finally by diathermy (King and Cocke),[5] 1930. Each of these methods has been used quite extensively by various workers.

Malaria has had by far the greatest use, and at the present is the method of choice in institutions or large cities where malarial blood is available at all times. In the hands of the occasional user, or in places where the plasmodium vivax is not available, typhoid vaccine should be preferred.

The chief contraindications to the use of malaria are severe generalized arteriosclerosis, aortic disease, active pulmonary disease, impaired renal function, and advanced age. The disease is produced by the intravenous injection of three to eight cubic centimeters of blood just

previously drawn from the vein of someone suffering either from "natural" tertian malaria or from induced malaria of as nearly true tertian form as it is possible to obtain. The blood is withdrawn into a syringe containing about four cubic centimeters of a one per cent solution of sodium citrate.

The onset of the chills occurs, as a rule, about four to twelve days after inoculation. Some fever may occur during this period, but not true paroxysms with chills followed by perspiration. Paroxysms should be accompanied by fever of 103 to 106 degrees F., which should remain 103 degrees to 104 degrees for six to ten hours. Chills may not accompany the temperature rise, but perspiration is usually marked. Headache and muscular pains are common, as is general malaise. After a true tertian strain of malaria has been used therapeutically for a time, it may give bizarre reactions, due probably to the absence of the sexual cycle of the parasite.[6]

The blood pressure should be checked daily, both during the chill and in the interval. The hemoglobin should be estimated every second day and it is well to check the blood chemistry twice weekly for renal function. Icterus must be watched for. If the patient's condition warrants it, ten to fourteen paroxysms are allowed to take place. If any of the following occur, the malaria is interrupted regardless of the number of chills: fall of blood-pressure below 100 systolic; severe anemia, failing renal function; persistent cardiac irregularity; jaundice (not to be confused with the icteric tinge seen with moderate anemia); any evidence of shock. There is a mortality of about 12 per cent attributable to the malaria itself,[2] but if the above warning signs be heeded this danger may be minimized.

In most cases the malaria may be readily checked by giving quinine sulphate by mouth, *e.g.*, ten grains thrice daily for a week, followed by five grains three times daily until the blood is free of parasites. In case of emergency quinine sulphate may be given intravenously. Neoarsphenamine is also effective against malaria.

The mechanism by which the malaria produces its beneficial effects is not definitely known. Fever and reticulo-endothelial stimulation are said to be responsible for the good results obtained.

The use of typhoid vaccine for producing therapeutic fever is somewhat safer than malaria in that the fever is always under the immediate control of the physician, and not dependent upon an active disease. The chief contraindications are advanced age and severe cardiovascular disease. The mortality due to the treatment proper is negligible. A course of treatment consists of from fourteen to sixteen intravenous injections of typhoid vaccine, or combined typhoid-paratyphoid vaccine, given every second or third day. Enough is given to produce a fever which rises to 103 degrees or 104 degrees F. or somewhat higher. The amount required varies with the individual and with each treatment. In this state a "triple typhoid vaccine," which contains 2500 million inactive bacilli per cubic centimeter, may be procured from the State Board of Health. It is best to dilute this stock solution with sterile normal saline, so that 200 million bacilli are to be found in each cubic centimeter. The first injection given should be about fifty million—a test dose. As a rule, each succeeding dose must be increased in order to secure the desired fastigium. The amount of increase varies with each patient, but seldom is each increment greater than 100 million. A second course may be given after a rest interval of eight to twelve weeks. Specific therapy may be used concurrently or in the rest interval, if desired. In any case, chemotherapy should follow the non-specific treatment.

The type of therapy to be used in any individual patient is determined chiefly by his condition upon recognition of the disease. Certain generalizations can be made but it cannot be too greatly emphasized that the treatment of each case is an individual problem. In primary or secondary syphilis, chemotherapy is favored. The treatment must be intensive from the outset and should be checked by serological studies, including cerebro-spinal fluid examinations, at the beginning of treatment and at least once every six months, for a minimum of five years. If neither asymptomatic or frank neurosyphilis has developed during this period and the patient is otherwise in satisfactory condition, he may be considered cured.

On the other hand, should the patient, despite intensive treatment, show signs of asymptomatic neurosyphilis, fever therapy must be considered. I feel that in those cases in which the cerebrospinal fluid presents the paretic formula, fever therapy should be instituted at once, if not physically contraindicated, and this should be fol-

lowed again by chemotherapy. Regular periodic serological examinations, as well as neuropsychiatric studies must be made over a period of at least eight years. In those individuals with asymptomatic neurolues who do not come within the group of paresis sine paresi, further specific treatment may suffice, but even here hyperpyrexial treatment should be instituted if possible. All these cases must be carefully followed for possible development of frank neurosyphilis.

Once general paresis proper becomes manifest, I feel that the best form of treatment is fever therapy, preferably malaria, if the physical condition will at all allow its being instituted. Chemotherapy, particularly tryparsamide, should follow and must be persisted in for at least two years. Periodic serological and neuropsychiatric studies must be made. Clinical improvement precedes serological improvement (which seldom becomes complete) often as long as two or three years.

As I have stated, the prognosis in general paresis, as a whole, has become less grave. The outlook in the individual case, once the condition is recognized, depends greatly upon the handling of the patient. Satisfactory statistics are not available as yet, in as far as I know, which allow of an estimate in terms of percentage of the preventability of the development of paresis by truly intensive treatment of early syphilis. The prognosis in those cases recognized in the stage of paresis sine paresi is good, although persistent treatment is required.

Early paresis responds more favorably than that in which the disease has been in evidence for long periods of time.

Since malaria and the other forms of fever therapy have been used extensively, alone or in conjunction with specific drugs, the number of remissions in frank general paralysis has increased greatly. To be said to be in a state of remission, the patient must possess insight, must be free of mental symptoms, must be able to resume his former place in society, and preferably be capable of self-support. Previously, a small percentage of temporary remissions occurred or were induced, but qualitatively they were far inferior to those secured by the newer methods of treatment, and were of much shorter duration. Results vary with the type of paresis, as well as with the duration of symptoms before therapy is instituted. In the expansive hyperactive type, better results are obtained than in the other groups. Some workers have reported as high as 75 per cent of remissions in such cases. The response in the demented type is poor.

Wagner Jauregg,[15] in 1924, reporting four hundred cases of paresis treated with malaria, and followed up, records 33 per cent showing complete remissions for two to seven and one-half years, while an additional 14 per cent showed incomplete remissions, with stationary status. This corresponds well with the average experience reported by most workers. It is essential that chemotherapy follow the nonspecific treatment if good results are to be obtained and maintained.

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FARM ACCIDENTS*

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EMERGENCY rural surgery, with its setting in the farm kitchen—a few kerosene lamps at points of advantage—the makeshift operating armamentarium, inconvenient in its crudeness, though many times ingenious, is largely a matter of history. In the early years of practice of many of us, who began our careers in the small rural community, about the only place that was available for rendering the emergency surgery that farm accidents necessitated was in the home. This was attended in a great many instances by unsatisfactory results, when we consider what those end results might have been. Though this type of practice was many times spectacular and made a good story, it did not tend to produce favorable statistics as regards traumatic surgery.

When I first located for practice in a small country town, the usual reaction was to call the doctor out to the home for every surgical emergency. Even more recently, when first located, as we now are, for group practice in a smaller city, which is quite a medical center for a rather extensive decidedly agricultural territory, the practice of calling the doctor out to the patient was very prevalent. But we have noted a change. An enlightened public was quick to appreciate the advantages of hospital treatment with its technical apparatus and trained workers. And "as the mountain will not come to Mohammed, Mohammed will go to the mountain," so the patient and the relatives, fully aware of the advantages to be gained, bring the patient, at times many miles, to the hospital.

Safe and rapid travel by automobile on improved roads has erased space and centralized rural activities. Though many minor accidents of the farm still are and can be effectively taken care of in the home or in the office of the rural practitioner, the major cases will nearly all find their way to the hospital for attention, both for first aid and subsequent care. It is now quite infrequent that, when we are asked to come out and see an accident case, the family hesitates at all to bring the patient in to the office or hospital for attention. Probably many of you who are practicing in rural communities will take issue with me on this point. But I can say that it is merely a matter of educating your clientele to this better way of handling the situation, and if it has not been accomplished the fault is with you. And with the constantly mounting number of accidents, it behooves us to institute the very best possible treatment, that the number of permanently disabled be kept at a minimum.

It has often been brought up for comparison that during the World War there were 50,000 deaths and about 200,000 injured, while during the same time in peaceful America 126,000 were killed by accidents and the injured ran into the millions. Recently the National Safety Council reported 95,000 deaths and 10,000,000 injured in one year.

In a consideration of traumatic surgery, with which this symposium is concerned, we can divide accidental trauma into three main groups: (1) transportation accidents; (2) industrial accidents; (3) accidents of usual pursuits.

My paper will concern itself with a discussion of one phase of the last group, namely, those accidents associated with farm life. That farming is a relatively hazardous occupation cannot be denied. With the constantly increasing number and types of machines employed in farm work and with the greater number of farm animals, many of blooded stock and immense size, handled by the farmer and his family, this hazard is constantly on the increase. Yet in a search through the records and from a review of our history files, I am impressed with the relative infrequency of distinctly farm accidents as compared with other types of major accidents occurring in a definitely agricultural community. In an effort to obtain some sort of a broad perspective as regards statistical information on this subject, I attempted to enlist the assistance of a national research service in obtaining authentic figures.

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After a number of weeks, however, I received a reply from them stating that a careful search of all available material failed to reveal any literature dealing specifically with farm accidents. I feel flattered, therefore, that this presentation becomes a somewhat pioneer effort.

Practically any type of accident can occur upon the farm, with its ever-increasing mechanical equipment and motorized transportation. For that reason the rural practitioner must be ready to handle the same accidents that occur in industry and in transportation. But in addition he must be prepared to cope with those emergency problems that are peculiar to rural practice.

For the purpose of this presentation I shall limit myself to a discussion of those situations and will present only such cases as fall definitely into one of the two following classes, namely: (1) accidents by farm machinery and equipment; (2) accidents by farm animals.

Let me mention a few general factors that enter into the handling and prognosis of traumatic surgery, before setting forth specific cases. The age of the patient is always an important factor. At the two extremes of life, trauma is always followed by more serious consequences. Industry is seldom concerned with either; transportation accidents involve more frequently the young than the old, while in farm accidents the aged enter more often into the picture. Thus in a consideration of farm emergencies or whenever dealing with an aged patient, remember that the important thing is to treat the person and not the injury. Always use every recognized method for promoting their recovery, even at the expense of a satisfactory surgical result. Remember that a live patient with a disability is better than a fatality with an ideal operative repair. Another factor that is equally important in traumatic surgery, and which calls for the exercise of that judgment which comes with experience, is to employ surgical intervention only at the right time. Shock, hemorrhage and the infection must always have our immediate attention, but proper judgment must be used to determine when and how to intervene for the preservation of best function.

That the question of infection in traumatic surgery has not been mastered is evident. Recent statistics reveal that 33 per cent of all accidents are complicated by infection. This is an indictment against our surgical treatment, for it always prolongs the disability, increases the hazard and jeopardizes the results. The thorough debridement of every accidental wound is imperative. This together with thorough mechanical cleansing with soap and water is to be preferred to too much dependence upon various antiseptics, many of them colorful but inefficient. If there is a question of serious wound infection, put in your sutures, but leave them untied for forty-eight to seventy-two hours. Then if there is no evidence of infection, the sutures may be tied and the wound closed.

It may be said that as a rule injuries produced by farm machinery present more objective or visible evidences of trauma and fewer remote findings, while the accidents produced by farm animals show the reverse. This is of importance in prognosticating, as you are usually asked to do by the family the moment you present yourself to see the case. Further points to bear in mind in the treatment of farm accidents I shall attempt to present to you in the discussion of the following few selected cases.

Case 1.—A boy, aged twelve, was brought to the hospital in a semiconscious condition by his father, who said that the lad had been driving a team attached to a wagon hauling manure, which the father was spreading. The ground was frozen and when the wagon struck a rough spot, the boy was thrown off the wagon, striking his head on a frozen lump of earth. He was unconscious when picked up, but had partly recovered by the time they reached the hospital. Examination revealed an extensive wound, laying bare, down to the bone, almost the posterior half of the top of the scalp. At the bottom of the wound, over the right posterior parietal area was a depressed fracture of the skull about 6 cm. in diameter. There was no other visible injury. In the operating room only a small amount of ether anesthetic was needed to thoroughly cleanse the wound, swab it with iodine, and close it firmly by suture without drainage. A small puncture wound was made through the scalp over the lowest point of the depressed fracture to prevent the collection of secretion in this pocket, and a pressure dressing was applied to secure firm approximation to the scalp. No attention was paid to the depressed fracture. A few hours after recovery from the anesthetic, the patient was sufficiently aroused to tell us that his left arm felt numb and that he could move it only with difficulty. The following day, however, he was much improved in this regard and in a few days motion and sensation of his arm were normal. The scalp wound healed nicely with very little drainage and no infection. About four weeks after the accident we performed the secondary operation. A new incision was made and the scalp elevated over the depressed fracture. A trephine opening was made at the edge of the depression and the depressed bone removed in several large pieces with a cranial ronguer. The dura showed no signs of laceration or adhesions and came up very nicely as soon as the bone was all removed. Likewise there was no evidence of splintering of the inner table. For these reasons the dura was not opened. The bony fragments were replaced over the dura in the defect and the periosteum and scalp closed firmly by suture. The wound healed nicely with a firm bony repair, and complete recovery of the patient.

I present this case to show skull injury, both to the soft parts and calvarium. Primary attention to correction of the skull fracture would have meant great risk of infection to brain and meninges. Besides, skull fracture seldom constitutes emergency surgery, except in one instance, and that is if accompanied by hemorrhage of the middle meningeal artery. When this condition is present it must have immediate surgical attention. Spinal puncture is seldom indicated for diagnosis in skull injury, for unless very carefully done with a small needle it will be followed by more harm than benefit. If our primary wound had become infected, it would have been necessary to wait four to six months after healing before proceeding with the secondary operation upon the skull. This is because of the residual infection which remains in the scar tissue, long after healing seems complete. This wait is especially necessary when bony tissues are involved in the secondary operation.

There is one remote effect of skull injuries that must be kept in mind. Fracture through the frontal or sphenoidal sinus gives direct contact with the brain and not the spinal fluid. The immediate reaction is localized and may be slight and of short duration. Weeks or months later the patient has a severe frontal or sphenoidal sinusitis, develops a localized meningitis or brain abscess and may die. This is due to the fact that the mucous membrane lining the sinus is easily stripped from the bone and may not suffer the same tear that the fracture presents. As a consequence it becomes interposed between the edges of the linear fracture and heals as a wick of mucous membrane against the meninges Subsequent infec-

tion of the sinus with involvement of the lining membrane offers direct extension to the brain. This cannot occur in the instance of fracture through the cribriform plate as there the mucous membrane is firmly adherent and cannot be detached. When healing takes place, if there is not an immediate fatal outcome, bony union results and no subsequent trouble occurs.

Case 2.—An adult male came into the office with the following history: While leaning over the edge of a hay rack on which he was standing to reach for a pitchfork that was stuck into a small cock of hay, he lost his balance and fell outwards so that the handle of the fork came against the right lower portion of his abdomen. He had become nauseated, complained of feeling faint and had severe pain at the site of injury. Examination revealed some subcutaneous hemorrhage over the lower right abdomen and a definite splitting of the superficial fascia with some protrusion of a hernial mass on exertion. He was confined to the hospital for two days, with ice bags to the area of the injury, and was then permitted to go home. As soon as the local tenderness had sufficiently disappeared, he was fitted with a webbing truss having a pad over the site of the hernia. This truss he wore for four months, when there was complete recovery and no further attention necessary. He had been advised to have an operation for the repair of the defect, but we did not feel that operative intervention in this type of injury was necessary. The tearing of the muscle and fascia is nearly always in the direction of the fibers, which heals well due to the approximating action in the line of tension. The occasional aspiration or evacuation of a hematoma is at times necessary.

Encounter with the other end of the pitchfork presents as a rule only the problem of a puncture wound, usually sustained in the hands or feet. The stab puncture wound produced by the tine, since it usually closes promptly, forms an excellent type of wound for the inoculation and growth of the anerobic organisms, such as the *Bacillus tetani* and the *Bacillus perfringens* of Welch. The possibility of such infection must always be borne in mind, and will be mentioned further in the next case.

Case 3.—A man, aged sixty-three, was brought to the hospital on September 17 with the following history: Earlier in the same day he had gotten out in front of the binder to adjust the reel and came therefore in front of the sickle facing forward. For some reason the horses became frightened and started ahead, with the result that he received cuts on the backs of both legs in the lower third, severing everything down to the tibia on both sides and also fracturing both fibulæ into several pieces. He had been attended by his local physician who had sutured the wounds with a few plain catgut sutures. I asked the patient if the doctor had injected any medicine into his thigh, and he answered that this had been done.

I have already referred to tetanus infection. I must strongly urge that in every farm accident, where there is a break in the continuity of the skin or mucous membrane so that such a wound comes into contact with farm equipment or animals or earth, such a case must be given a prophylactic injection of tetanus antitoxin when first seen. For that reason I questioned about it in this case, but judging from developments, the hypodermic given must have been an opiate.

On admission and during the first week in the hospital the temperature range was between 99 and 101 degrees. Later it went as high as 104. About the third and fourth day the catgut sutures sloughed and the wound opened. The eighth day the patient complained of sore throat and said "he thought a cold was coming on." This I interpreted as the onset of tetanus and we promptly gave him 10,000 units of antitoxin intravenously. The following day he had stiffness of his jaw, and he was given 10,000 units of antitoxin intraspinally. This was followed by further doses intraspinally and intravenously for a total of 45,000 units in a period of eight days. This controlled the disease and brought him through to an ultimate recovery. In addition the wound was opened widely, and small tubes inserted into the depths of the wound, and wet hychlorite dressings employed, varied at times by irrigations with hydrogen dioxide solution.

The important factors in the control of tetanus are:

1. The prompt administration of prophylactic antitoxin when the case is first seen.

2. Early recognition of suspicious symptoms for diagnosis, even before neurological findings are manifest. There is no set time for tetanus to appear, as it may be after two days, or as late as thirty or forty days following accidental inoculation.

3. After the onset of symptoms, prompt administration of large doses of antitoxin, 10,000 to 20,000 units, depending upon the severity of the infection, to be followed by further dosage as the progress of the disease indicates.

4. Prompt opening of the wound by releasing sutures to permit aeration. After healing by granulation, secondary operation should not be undertaken for several months. It should then be preceded by prophylactic administration of antitoxin and the weekly intramuscular injection during the period of healing of 1,000 units of the serum.

5. The control of nervous system manifestations. This is accomplished by avoiding all mental and physical stimulation. The use of various sedatives, especially the newer and more active barbiturates. Likewise the use of avertin has proven of value.

Since there is naturally a large amount of the toxin in the blood stream before it affects the nerves, we employ both the intravenous and intraspinal route of administration. Intramuscular injection is too slow for emergency treatment as complete absorption requires twelve to twenty-four hours.

Case 4.—A male, aged forty-six, had been kicked by a horse on the chin three days before coming to us. There was deformity of the lower jaw but no laceration of the skin. He had been given attention by his local physician, but felt that the result would not be satisfactory.

An x-ray examination revealed a double fracture of the mandible, with complete oblique separation at the outer anterior angle on each side. Though the condition of the teeth, many of which were missing, and others loose, made the case really unfit for wiring, nevertheless this was attempted. After a couple of days it was evident that this would not be satisfactory. Lack of opposing teeth also permitted the fracture to get out of place vertically. Therefore, under local anesthesia short incisions were made back of the margin of the jaw under each fracture. Through these incisions silver wire loops were placed in the inferior edge of the mandible to hold the fracture together, avoiding communication with the oral cavity. To keep the lower and upper jaw approximated I devised a support which consisted of a head harness made from straps of webbing. A pair of buckles were fastened as far forward as possible, one on each side. The two back buckles were dropped down on straps so as to come below the ears and were connected by a strap across the nape of the neck. A large enough piece of thin inner automobile tube was obtained and a piece cut out having an oval body with an opening for the chin and four tails that fastened to the buckles. The front pair of tails were cut so as to exert an upward pull and the two back tails so as to give a backward pull. The elasticity of this latter piece made it possible to have it conform to the face and act as a splint against the lower and upper jaw and to exert a constant approximating pull without being too uncomfortable or tight. Non-elastic bandages soon become stretched, loose and useless for the purpose. After the head harness had been prepared and applied, and with the silver wire loops in place we had no further trouble in obtaining an excellent result. As soon as sufficient callous had formed to fix the fragments, the wire loops were removed and the wounds healed promptly.

Case 5.—A farm boy, aged thirteen, was brought to our clinic with the history that the same day, while riding a horse, he had fallen off and struck his right shoulder against the ground. Examination revealed that he was unable to handle his right arm and that he complained of pain in the right shoulder on motion. There was deformity present with displacement of the arm inwards. An x-ray examination revealed a fracture of the neck of the right humerus, with the proximal end of the distal fragment displaced anteriorly and mesially under the pectoralis muscle. Under anesthesia, reduction was attempted and the arm put up in an aeroplane splint under traction. Several x-rays were taken and we made numerous adjustments of our dressings in an attempt to obtain the desired result. At the end of ten days the patient was sent home to report in a week. The position we had was not as good as we would have liked,

since there was over-riding of the fragments, but we felt that it would give a satisfactory functional result. Furthermore, we did not seem to be able to obtain a better position without open intervention, which we preferred to avoid in a young subject.

When the boy returned for observation in about ten days, we found on making an x-ray examination that the position of our fragments was much worse and definitely unsatisfactory. While there was good callous formation from the distal end of the proximal fragment, there was none at all from the proximal end of the distal fragment. For that reason a diagnosis of interposed soft parts was made, and open reduction advised. This was promptly done under general anesthesia. Soft parts were found covering the end of the distal fragment as suspected and there was some difficulty in obtaining just the position we desired. This was finally accomplished, and two bone pegs, which we made from beef bone, were inserted through the end of the shaft, at an angle, into the head of the humerus. A strand of kangaroo tendon was employed for additional fixation. The wound was closed and healed nicely, with the arm fixed to the side of the patient, so as to have as little movement as possible. An x-ray taken two months after the operation showed the fragments in excellent position, good callous formation, and beginning absorption of the bone pegs.

Case 6.—A male patient, aged twenty-eight, was brought to the hospital by ambulance. Three days previously he had been attacked by a bull, and butted about a good deal. He had saved himself somewhat by hanging onto the ring in the bull's nose, and had been finally shoved into a straw stack and left there. Aside from general body bruises, he had much pain in his right chest and complained of difficulty in breathing. His temperature was 102 F., with a pulse of 120 and respirations 26. There were ecchymoses over his right chest wall and a definite subcutaneous emphysema along the right costal margin, laterally. X-ray examination revealed a traumatic pneumothorax on the right side. This had apparently been more extensive at first and was in the stage of restoration when we saw him, since the mediastinum was displaced slightly to the right and there was compensatory emphysema on the left side. He was treated with ice bags to the chest wall and adhesive strapping, with sedatives administered to control cough and pain. After five days his temperature was normal and he was discharged from the hospital on the twelfth day. X-ray taken a couple of days before leaving the hospital showed further absorption of the pneumothorax, but some fluid in the right pleural cavity. This was not disturbed and another x-ray taken at the Clinic two weeks after discharge from the hospital showed normal restoration of the right chest. In this type of injury, symptomatic treatment is the procedure to persue, with drastic intervention only when absolutely necessary.

In conclusion, I wish to emphasize these few points:

1. Farm accidents are relatively infrequent in the field of traumatic surgery, considering the large rural population.

2. Rural traumatic surgery merits the same hospital facilities as city.

3. Prolonged or permanent disability is in the majority of cases an indictment of the methods of surgical treatment.

AUTOMOBILE ACCIDENTS*

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THAT automobile accidents are of importance cannot be denied. Approximately 33,500 persons were killed in motor vehicle accidents in the United States during the year 1931, as against 32,939 in 1930; 23,430 in 1926, and 13,939 in 1921. The figures for 1932 are not as yet available. The Metropolitan Life Insurance Company reports that one-third of all accidental deaths among nineteen million industrial policy holders were due to this cause. It is the only type of accidental death which is now increasing in this country. In 1930 among the insured it caused as many deaths as the four principal epidemic diseases of childhood, namely: measles, scarlet-fever, whooping-cough and diphtheria, combined. In that year there was one automobile fatality to every four deaths from cancer, to every three from apoplexy and to every seven and one-half from heart disease, the leading cause of death. More than 2 per cent of all deaths from all causes are now due to automobile accidents. The increase in rate has been among those over the age of fifteen. There has been since 1929 a distinct drop in the death rate in children under fifteen.

The heavy increase in mortality has existed in collision between two automobiles. The present crime situation is deserving of, and has received, the most widespread attention. Protection of the public from criminals is certainly a task of major importance. And yet, in terms of lives lost, the motor vehicle accident problem far overshadows the crime problem. Figures for the latest available year, 1929, indicate that more than three times as many persons are killed by motor vehicles as meet death at the hands of criminals.[3]

The subject, accordingly, today is timely but inasmuch as there is no injury of which I am cognizant which occurs as the result of motor vehicle accidents which is not duplicated by some other form of trauma, I shall consider the subject purely from a statistical viewpoint. Much in the way of data has accumulated. I have already given you figures taken from the last report of the National Safety Council and statistical material gleaned from the Metropolitan Life Insurance Company reports. As physicians, it does not immediately concern us as to the cause of such accidents, but the results of such accidents certainly do and should concern us. The immediate cause of death of an individual involved in an automobile accident is often diffi-

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cult to determine and for that reason no statistical data as to the cause of death have, as far as I have been able to find, ever been published. This is true also because of the multiple injuries often sustained. The closest approximation, however, to the accumulation of such data is in an article published in the *Archives of Surgery* in March, 1929, by Bacon and LeCount of Chicago, giving the postmortem findings in 383 consecutive cases of individuals killed by motor vehicles. The ages of these individuals ranged from four to eighty-eight. Of course, in many of these individuals multiple injuries were found. However, just to give a brief outline of the injuries, we might cite the following data: In 223 of these cases the skull was fractured; over 58 per cent had fractures of the cranial and facial bones; 44 per cent plus—fractures of the ribs; over 27 per cent —fractures of an extremity; 15 per cent plus—fractures and dislocations of the spine; and over 10 per cent—fractures of the pelvic bones. In only twenty-three cases in this series were there no bones broken. In 34 per cent of the fractured rib cases there were lung lacerations. The heart was found ruptured in six cases. There were numerous cases of extensive tear of a large blood vessel. The diaphragm was ruptured in twelve cases; the liver in fifty-three; the spleen in twenty-five. There were no cases of lacerations of the pancreas but in four cases contusion of the pancreas were found. A kidney was found bruised or torn in twenty-five instances. Strangely enough most of these were on the right side.

I have been unable to find any literature or statistical data relative to the injuries sustained in non-fatal automobile accidents, and, accordingly, thought that it might be of interest to give briefly the results of an analysis of 1,000 consecutive cases, the records of which are in my office. I apologize for not including a larger series in this paper but the analytical work on these alone proved rather large and I am inclined to believe that the resulting figures in a possible 5,000 cases would not differ materially from those in this 1,000. The cases include not only individuals cared for but individuals examined from a medico-legal viewpoint. The injuries or symptoms cited were frequently not evident at the time of examination but if claimed by the patient were included.

The cases in this series run from under a year to the age of eighty, over 55 per cent occurring in the second, third and fourth decade and by far the largest group centering around the age of twenty. The sexes are about equally divided. Passengers, however, were injured more than twice as frequently as drivers. Of the total, over one-fourth were pedestrians. Contrary, I believe, to the usual opinion (though I have seen no statistics on this point), over twice as many accidents occurred during the daytime as at night. It was exceptional to encounter an individual with but a single injury. Few escaped, among other injuries, contusions and abrasions. Thus approximately three-fourths of the number gave histories of, or showed signs of, contusions and abrasions. Over 15 per cent of the entire group received lacerations of the face, many of them disfiguring, and almost 5 per cent of the individuals had broken, loosened or missing teeth. The majority of the lacerations were caused by glass, and over 20 per cent of the individuals had lacerations other than on the face. Sprains and strains were exceedingly common, occurring in over two-thirds of the cases. Although but ninety-six in the group gave a definite history of unconsciousness, which included 19 skull fractures, 178 individuals complained of headaches. Many of these individuals gave no history whatsoever of any blow of any sort on any portion of the head or face. Nervousness was a symptom commonly complained of, particularly among the women, and many of these complaining of nervousness also complained, without head injury, of headaches. Among the ninety-six patients giving a history of unconsciousness there were but thirty-six that gave a true history of concussion. On close questioning it was found that many of these individuals who gave a history of unconsciousness had merely fainted. Although there were, as just stated, but thirty-six frank cases of concussion and nineteen proven cases of skull fracture, nevertheless seventy-nine complained of vomiting and 70 of nausea. In some, however, vomiting was associated with other injuries, such as intra-abdominal injury and abdominal wall contusion and were not associated with head injuries. Forty-nine women complained of marked upset in the regularity of their menstrual periods and there were seven cases of miscarriages attributable to the accident. There were seventeen cases of frank hysteria, practically all of them in women, and practically all of them passengers. The majority of these had no physical injury whatever or only relatively slight physical injury. Seven individuals attributed the development of an inguinal hernia to the accident which they had sustained.

Almost every imaginable symptom and development of symptoms was attributed, particularly in the cases having legal aspects, to the automobile accident which the patient sustained. Among these might be noted diarrhea, pneumonia, fainting spells, wrist ganglion, cough, bladder and bowel disturbance, loss of hair, vaginal discharge, loss of breath, heart disease, nephritis and frequent urination. There were but two cases of proven ruptured kidney and but two dislocations in the entire group. There were a number of definite nerve injuries, most of them associated with fractures, particularly of the humerus and the head and neck of the fibula. In going over these cases I was surprised at the relatively small total number of fractures encountered. Two hundred fifty-six fractures occurred. Inasmuch as certain individuals received more than one fracture, the total number of individuals sustaining fractures is considerably less than this figure. Many more passengers and pedestrians suffered fractures than did drivers. The fractures were divided as follows: Skull 19, face 19, vertebræ 10, pelvis 10, coccyx 3, clavicle 17, scapulæ 3, fingers 3, Colles fracture 2, humerus 10, radius 7, ulna 12, olecranon 2, metatarsals 2, tarsals 1, patella 2, femur 11, tibia 26, fibula 25, metacarpals 5, carpals 1, ribs 55, sternum 1. These figures tally closely with those given by Ramsey[4] of London, Ontario, who without giving any statistics states that the adult injured in an automobile accident, if injured in the lower ex-

tremity, usually receives a comminuted fracture of the tibia.

This report, gentlemen, has been brief and purely statistical, and based, I fear, on an insufficient number of cases to allow us to come to any definite conclusion. However, in view of the lack of literature on this subject it seemed to me that the figures given might be of interest. Later, with more time at my disposal, I hope to be able to analyze a very much larger series of cases so that we may be able to know, as physicians, approximately what we are apt to encounter when called to care for an automobile accident and what might happen to us as individuals if we ourselves should be involved.

I cannot refrain from expressing the distinct impression gained from an analysis of this 1,000 cases, that the more trivial the physical injuries the greater are the patients' complaints and the more chance there seems to be of litigation.

In closing, may I make a plea. The medical profession throughout its history has unselfishly contributed to the decrease in mortality and morbidity of the human race, accomplishing this not only through research of brilliant minds but also by education of the public. Is there not something that we, as physicians and citizens of these United States—156,440 strong—can do by united influence to decrease these accidents and thus lessen our general death rate, prevent untold suffering and make this a safer country in which to live? Think it over.

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INDUSTRIAL ACCIDENTS*

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SINCE the enactment of the Workmen's Compensation Law the medical profession has been expected not only to treat Industrial Casualties but to give advice on the various medico-legal points that develop in relation to claims arising therefrom.

Many surgeons have concentrated their attention on the immediate care and treatment of these cases and often have lost sight of the fact that it is also important to keep accurate records and to render reports of the injuries and their subsequent progress, and have failed to familiarize themselves with the Industrial Laws governing these cases, as well as the methods used in evaluating end results in those cases that show some permanent disability. There are still many in the profession who have not had the opportunity or the necessary experience in handling these cases to intelligently advise in their solution.

There are various definitions given of what constitutes an accident in different states, and it may be well at this time to quote from the Minnesota Statutes their definition of an accident:

"An accident means an unexpected or unforseen event happening suddenly and violently with or without human fault and producing at the time injury to the physical structure of the body." (4 Minn. Workmen's Compensation Decisions, 1926-1927.)

An industrial accident means a personal injury by accident arising out of and in the course of employment. All cases here reported are subject to the Industrial Laws. Evaluation of end results must be approved by the Industrial Commission before final settlement can be made.

The various degrees of disability are classified as follows: Temporary Partial; Temporary Total; Permanent Partial; and Permanent Total Disability.

"Temporary partial disability means that an employe has received an injury but is able to do part of his usual work, and this disability continues until he has completely recovered.

"Temporary total disability means that as a result of an accident an employe is totally disabled from work and when his recovery is complete he is physically the same as he was before the accident.

"Permanent partial disability means that an employe has some permanent loss of function to the physical structure of his body as the result of accident.

"Permanent total disability means that as a result of an accident an employe is so permanently injured that he will never be able to pursue any gainful occupation again."

As there appears to be some confusion about compensation awards it may be well to read some of the regulations set forth by the Compensation Laws of the State of Minnesota governing them:

"The schedule of compensation provides for injuries producing temporary total disability sixty-six and two-thirds per centum (66⅔%) of the daily wage at the time of injury subject to a maximum compensation of twenty dollars ($20.00) per week."

"In all cases of temporary partial disability compensation shall be sixty-six and two-thirds per centum (66⅔%) of the difference between the daily wage of the workman at the time of injury and the wage he is able to earn in his partially disabled condition. This compensation shall be paid during the period of such disability, not however, beyond three hundred weeks."

"In all cases of permanent partial disability it shall be considered that the permanent loss of use of a member shall be equivalent to and draw the same compensation as the loss of that member, but the compensation in and by said schedule

*Read in Symposium on Emergency Surgery before the annual meeting of the Minnesota State Medical Association, Rochester, Minnesota, May 24, 1933.

provided shall be in lieu of all other compensation in such cases."

"In cases of permanent partial disability due to injury to a member resulting in less than total loss of such member not otherwise compensated in this schedule, compensation shall be paid at the prescribed rate during that part of time specified in the schedule for total loss of the respective member which the extent of injury to the member bears to its total loss."

"In addition to the compensation provided in the foregoing schedule for loss or loss of use of a member, compensation, during the period of re-training for a new occupation as certified by the Division of Re-Education, shall be sixty-six and two-thirds per centum (66⅔%) of the daily wage at the time of injury not exceeding twenty-five weeks (25), providing the injury is such as to entitle the workman to compensation for at least seventy-five weeks (75) in the schedule of indemnities for permanent impairments, and provided the Industrial Commission on application thereto shall find such re-training is necessary and make an order for such compensation."

TOTAL NUMBER OF CASES

Abrasions	44
Amputations	18
Burns	84
Contusions	254
Crushing injuries	18
Dislocations	9
Foreign bodies	104
Fractures	227
Hernias	28
Lacerations	519
Puncture wounds	157
Sliver wounds	89
Sprains and strains	443
Miscellaneous	6
Total	2,000
Male	1,806
Female	194

This report is presented to show the various injuries, their location, frequency of occurrence, the average age at which they occur, average time lost and end results in two thousand cases of industrial casualties. The time allowed for this report will not permit of any extensive discussion of treatment, or types of instruments used in estimating disability. The various injuries are classified as follows, and for convenience they have been divided into six groups:

GROUP I—ABRASIONS

Location	Number	Av. Age	Av. Days Lost
Upper extremities	30	33	3
Lower extremities	14	41	8
	44		

CONTUSIONS

Hand and forearm	80	32	0
Arm and shoulder	10	38	0
Foot and leg	75	35	0
Knee	25	34	11
Head and neck	15	36	0
Chest	19	33	6
Abdomen	2	44	1.5
Thighs (inguinal region)	13	37	8
Back	4	26	0
Multiple contusions	11	50	25
	254		

BURNS

Head and neck	16	34	5
Hand and wrist	38	29	9
Forearm	11	32	10
Arm and shoulder	3	33	4
Thigh	1	59	3
Foot	15	31	7
	84		

Group I—In Group I are the abrasions, contusions and burns, and they comprise nearly one-fifth of the entire number of injuries. The greatest number of injuries shown in this table are the contusions. The next in number are the burns—the majority of which were of the second degree. The ambrine wax method was used in the treatment of most of them with the most gratifying results, as well as comfort to the patient. We found it gave rapid relief from pain, and convalescence was shorter than in other forms of treatment, and very few of those of greater degree showed scar formation. In the secretory state of burns characterized by exudation of serum, the affected surfaces were painted daily with a mild aqueous solution of mercurochrome. During the subsiding period the periphery of the burned area was treated with scarlet red to stimulate the growth of skin. The tannic acid method was also used in some of these cases, but was found more difficult to handle in those patients who were ambulatory. The abrasions were the smallest in number shown on this table. Twenty-three per cent of them were infected and these individuals were the only ones that lost time.

GROUP II—PUNCTURE WOUNDS

Location	Number	Av. Age	Av. Days Lost
Face	2	38	2
Neck	1	55	3
Breast	1	27	0
Buttocks	2	36	0
Fingers, hand, wrist	74	33	4
Thighs	3	25	0
Knee	3	33	4
Foot and ankle	71	29	4
	157		

FOREIGN BODIES

Eye and Eyelid	95	30	0
Ear	1	25	0
Forearm	1	36	49
Elbow	1	49	10
Fingers and hand	6	36	7
	104		

SLIVERS

Fingers, hand, wrist	86	29	4
Head and neck	1	45	0
Thigh	2	21	4
	89		

Group II.—In Group II are the puncture wounds, foreign bodies and slivers and they comprise less than one-fifth of the entire number of injuries. The greatest number of injuries shown in this table are the puncture wounds, one case having permanent loss of function in the hand. The next in number are the foreign

bodies, and with the exception of those about the eye are usually caused by steel, which is easily located and removed with the assistance of the fluoroscope. Foreign bodies in the form of slivers have been grouped separately because they are usually the result of wood fibre which cannot be seen under the fluoroscope, and the smaller sliver cases usually come in for treatment after some fellow worker has attempted to remove them, and are usually infected. A funicular opening is made in puncture wounds located on the palmar side of the hands or fingers and plantar aspect of the foot. This opening is carried through the skin into the fascia and is inspected for debris or contaminating matter before being treated. Antitetanic serum is used routinely in these types of injuries. "Infection is the greatest contributor in the time lost factor, as well as the cause of permanent disability."

GROUP III—STRAINS AND SPRAINS

Location	Number	Av. Age	Av. Days Lost
Neck	5	29	10
Shoulders—strain	34	36	15
Shoulders—sprain	22	34	43
Elbow	16	36	22
Wrist	22	30	21
Forearm	8	34	15
Fingers, hand	16	31	1
Chest	29	38	6
Abdomen	6	26	3
Inguinal region	14	31	2.5
Back	14	23	6
Lumbosacral strain	137	35	14
Sacroiliac strain	23	34	77
Hip	3	47	50
Thigh	3	37	1
Knee strain	13	33	15
Knee sprain	21	35	45
Leg	4	45	35
Ankle strain	22	32	4
Ankle sprain	25	34	12
Foot	6	45	21
	443		

HERNIAS

Location	Number	Av. Age	Av. Weeks Lost
Right inguinal	14	35	6
Left inguinal	14	35	6
	28		

Group III.—In Group III are the strains and sprains and hernias and they comprise nearly one-fourth of the entire group of injuries. In the table of strains and sprains the greatest number were in the lumbosacral, ankle and shoulder regions. All the cases seen in this group come from a class of men employed in heavy manual labor. There is no light work to which to return these men after they have improved, and they must be treated and kept under observation until they are able to return to their usual occupations. Therefore, it will be seen that the average time lost in this type of injuries is greater than that lost in other occupations. The cases that show the greatest time lost in this group are the sprains of the knee, sacro-iliac region, the leg and shoulder. Protraction of disability in the sacro-iliac group is usually caused by an accompanying neuritis. The persistence of severe symptoms in the sacro-iliac group undoubtedly is due to the difficulty of maintaining immobilization as well as complexity of the structures involved, and in some cases an honest effort is not made to return to work. Fifty per cent of the knee cases were complicated either by a bursitis or synovitis. Disability was prolonged in one case of leg sprain due to tearing of the plantaris muscle. Twenty-five per cent of the shoulder sprains were protracted due to bursitis. Four cases in the entire group showed some permanent disability. Two were of the knee with an average permanent loss of 10 per cent, and two of the shoulders with an average permanent loss of 13 per cent.

All the hernias in this table were of the indirect type and they were equally divided between right and left. Compromise settlements are usually made in hernia cases since the Supreme Court in this state has held that an aggravation of a pre-existing hernia is compensable, as well as a recent hernia following trauma.

GROUP IV—LACERATIONS

Location	Number	Av. Age	Av. Days Lost
Head and neck	63	35	1
Shoulder	1	32	7
Forearm	16	37	7
Fingers, hand, wrist	397	31	5
Hip	3	33	7
Buttocks	1	31	42
Leg	11	29	10
Knee	4	32	1
Ankle	4	42	63
Foot	19	29	11
	519		

DISLOCATIONS

Sesamoid	1	0
Inner end of clavicle	1	112
(fractured skull)		
Mid-phalanx middle finger	1	21
(sprain of extensor tendon)		
Foot (bi-malleolar fracture)	2	84
Lunate (fracture of ulna)	1	84
Left index	1	0
Wrist	1	0
Lunate	1	70
	9	

AMPUTATIONS

Fingers	15	32	65
Hands (both)	1	27	356
Toes	2	30	84
	18		

Group IV.—In Group IV are the lacerations, dislocations and amputations, comprising about 27 per cent of the entire number of injuries. The greatest number in this table are the lacerations, principally of the fingers, hand and wrist. Of this number twenty showed evidences of profound infection with tendon sheath involvement. Six suffered some permanent disability of either the thumb or fingers, as follows:

	Per cent
Right thumb	10
Right thumb	15
Ring finger	25
Index finger	12
Index finger	35
Middle finger	25

Two cases of injury about the ankle joint involved the tendo-Achilles and one involved the subastragaloid joint as well, with a disability of fourteen weeks and a subsequent 40 per cent permanent loss of function in the foot. Twenty-nine cases in this group have lost as a result of infection alone an average of five weeks. The average age in cases suffering permanent disability in this group was thirty-nine years.

All the amputations in this group were located in the upper extremities. In one case involving both hands, the first metacarpal and proximal carpal bones were saved on one hand, and this man has been rehabilitated and is now earning three times the salary he was receiving at the time of his injury.

GROUP V—FRACTURES

Location	Number	Av. Age	Av. Weeks Lost	Perm.
Skull	3	40	20	1
Nose	1	32	1.5	0
Lower jaw	1	45	12	0
Clavicle	1	18	6	0
Ribs	12	37	5	0
Scapula	1	39	4	0
Humerus	5	38	16	2
Radius	15	32	7.5	2
Ulna	8	34	8	1
Both bones	2	22	30	0
Carpus	6	28	4	1
Metacarpals	8	35	6	2
Phalanges	44	37	5	3
Spine	7	38	52	1
Pelvis	15	57	26	0
Femur	5	44	44	1
Patella	2	37	19	0
Tibia	7	46	14	2
Fibula	5	40	10	1
Both bones	8	48	28	7
Ankle	4	40	18	2
Tarsals	8	42	14	2
Os calcis	9	45	16	8
Metatarsals	10	33	10	2
Phalanges	40	35	3	0
	227			

Group V.—In Group V are the fractures. Of the entire number of injuries 11.4 per cent were fractures, and of these 16 per cent showed some permanent disability, varying from 5 per cent in the fibula to 60 per cent in the foot. Three radial fracture cases with an average age of forty-two years had an average 13 per cent permanent loss of wrist function. Eight cases of impacted comminuted fracture of the os calcis had an average 20 per cent loss of function of the foot—the average age being forty-five years. In the tibia-fibula group of permanent disabilities five of the cases were compound comminuted fractures, average age fifty plus and an average disability of 30 per cent loss of ankle function; while two others in this group had 17 per cent permanent loss of ankle function. One man with a compound metatarsal fracture who had received 1,500 units of antitetanic serum immediately after the accident developed tetanus five weeks after the injury, and was given 310,000 of antitetanic serum and made a complete recovery. In the immediate treatment of fractures traction splints should be applied before the patient is removed to the hospital and before hemorrhage or much muscle spasm has developed because when this has occurred reduction is always more difficult. Compound fractures, if from a spicule puncture from within, are usually sterilized and sealed, and where the compounding is from without, thorough debridement and suture is done. Antitetanic serum is given in all compound fractures. Skin or skeletal traction was used in the treatment of these fractures. Passive massage and early movement was instituted while traction was maintained. Consolidated union was established in all cases.

Miscellaneous.—In the miscellaneous group which consists of six cases there are two cases of interest: one an infected pilonidal cyst following trauma over the sacrum; and the other rupture of the ileum following direct trauma to the abdomen, with a fatal termination within forty-eight hours.

Two deaths occurred in this series of cases, one a transverse myelitis following fracture of the spine, and the other a ruptured ileum following trauma.

The wide variances in estimating disability is usually found in Permanent Partial disability, and it is imperative that the medical profession adopt some standard of estimating disability before uniformity in these evaluations can be obtained. Henry H. Kessler, medical director of the New Jersey Rehabilitation Clinic, has presented a simplified method by which the various factors causing disability may be measured. He takes function to represent the true measure of disability. Function resolves itself into three physiological factors, namely, motion of the joint, strength of the muscles and coördination and control from the brain through the peripheral nerves. The measurement of these factors is used as a basis for determining function in the extremity. To secure uniform results, only objective findings may be used in determining function. Only active motion should be measured. In estimating function in the hand there are three component parts that must be considered: (1) the grasping power for small objects between the folds of the fingers; (2) the grasping power for large objects between the fingers and the palm of the hand; and (3) the opposition between the thumb and the tips of the fingers. All medical, surgical and occupational therapy, as well as physiotherapy, must be given a complete trial before final estimation of permanent disability is made.

The same general principle is followed in estimating function in the lower extremity, with weight bearing assuming the place that prehension occupies in the upper extremity.

EMERGENCY SURGERY OF THE ABDOMEN*

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IN THIS discussion I wish to confine myself to a consideration of the nontraumatic intraabdominal lesions and more particularly do I wish to stress the early recognition of the more frequent acute emergencies and their differential diagnosis.

Moynihan has aptly stated in speaking of the early recognition of abdominal emergencies, "This is the one department in Medicine in which the practitioner should be most familiar. Acute abdominal emergencies call for skill and prompt action as in no other field of Medicine."

Zachary Cope states:

"Acute abdominal disease furnishes one of the best examples of the great value of clinical experience in diagnosis. The laboratory has little or no place in the diagnosis of acute appendicitis or the perforation of a duodenal ulcer.

"In these days when it is the tendency to belittle clinical diagnosis, it is all the more important that we should stress those conditions that depend for successful treatment upon early diagnosis."

Bevan has emphasized the theory of probabilities in the interpretation of abdominal lesions, for example: a boy of twelve years with abdominal pain should suggest appendicitis; a young woman with abdominal pain, salpingitis or ectopic pregnancy; a middle aged woman with upper abdominal pain, gall-bladder disease.

Oftentimes the differential diagnosis of an acute abdominal lesion cannot be definitely made. In such a case one must recognize that an acute abdominal emergency exists and exploration performed and the diagnosis confirmed later.

As regards the incidence of acute emergencies and their relative occurrence, Butler has shown in a study of 1,802 acute surgical abdominal cases that acute appendicitis occurred 997 times, or in approximately one-half the cases. The remaining 50 per cent were made up of the following in this order: hernias (incarcerated or strangulated), gun shot wounds, bowel obstruction, perforated ulcer, multiple abdominal injuries, ectopic pregnancy and acute cholecystitis.

During the year 1932 there were performed in St. Mary's and St. Luke's Hospitals, Duluth, 386 operations for acute abdominal emergencies. Two hundred ninety-six, or approximately three-fourths of the cases, were for acute appendicitis. The remaining one-fourth comprised in this order: obstruction (including strangulated hernia), acute cholecystitis, ectopic pregnancy and perforated ulcer. There was one each of the following: Meckel's diverticulitis, perforated ulcer of the ileum, twisted pedicle of an ovarian cyst, torsion of the omentum, intussusception, volvulus, ruptured viscus, ruptured bladder and ruptured spleen.

Acute appendicitis then is the most frequent intraabdominal emergency. It is estimated that 20,000 people die yearly from appendicitis in the United States. During the past two decades the mortality rate has apparently increased. Kolodny states that the relative frequency of death from appendicitis in this country was 11.4 per 100,000 in 1910 and 18.1 in 1930. He ascribed this increasing mortality to delay and the casual operator. Wilkie has stated that the death rate is the same as twenty years ago. Deaver has said that purging, the failure to call the physician early, or the failure of the physician to recognize the condition, and expectant treatment are factors in the increasing mortality of appendicitis.

The classical syndrome of acute appendicitis, as described by Murphy, is well known: a fairly rapid onset of upper abdominal pain, associated with vomiting; after a few hours localization of the pain to the right lower quadrant, slight fever, and tenderness over McBurney's area. Murphy failed to distinguish between the acute non-obstructive and obstructive types.

Wilkie states that the case of non-obstructive inflammatory appendicitis is usually recognized early, and that 90 per cent of deaths from acute appendicitis occur in the obstructive type.

Anomalous positions of the appendix (retrocecal, intrapelvic, subhepatic or left sided) may give rise to difficulties in diagnosis. However, it is always well to keep in mind the significance of local tenderness, muscle spasm and hyperesthesia in the localization of an inflammatory process.

It is well to recognize that every acute inflammatory intraabdominal lesion may simulate at times acute appendicitis. In children one must frequently distinguish acute appendicitis from enteritis and the parenteral infections, pyelitis and pneumonia.

In enteritis or enterocolitis the onset is less acute, the pain is more distinctly colicky in type, vomiting and diarrhea are more evident, abdominal tenderness and rigidity are less pronounced and hyperesthesia is absent.

The recognition of pyelitis may be difficult because its onset may not suggest genito-urinary disease. Pain beginning on the right side, associated with high fever, frequency and burning urination and pus in the urine, point to the correct diagnosis.

Pleurisy and pneumonia may mimic acute appendicitis. Sudden high fever, increased pulse, abdominal breathing, circumoral pallor and flushed cheeks may suggest its onset. In pneumonia there is an early and marked leukocytosis. Abdominal tenderness and rigidity are less evident and hyperesthesia is absent. An x-ray plate of the chest in any questionable case will oftentimes make clear the diagnosis.

*From the Duluth Clinic. Read in Symposium on Emergency Surgery before the annual meeting of the Minnesota State Medical Association, Rochester, Minnesota, May 24, 1933.

Less common conditions in children which may simulate acute appendicitis are acute infectious diseases, especially those involving the upper respiratory tract, Meckel's diverticulitis, intussusception, mesenteric adenitis and pneumococcic peritonitis.

In young women acute appendicitis most frequently is confused with pyelitis or pyelonephritis, salpingitis and ectopic pregnancy. In acute salpingitis the patient appears less ill. Vomiting is rarely present. The pain and tenderness are more diffuse. Abdominal rigidity and distention are more pronounced in the lower abdomen. Vaginal examination will show the uterus and adnexa to be tender and perhaps fixed. A smear from the cervix may be positive.

In early or mid-life acute appendicitis is most often confused with acute gall-bladder disease, obstruction, ruptured gastric or duodenal ulcer or acute diverticulitis. Diverticulitis should be considered in any patient over forty, with discomfort in the lower abdomen, especially in the left iliac fossa, with fever, distention, vomiting, irritability of the bladder, diarrhea or constipation, and melena.

Mechanical obstruction is the second most common acute abdominal emergency. External strangulated hernia makes up almost two-thirds of this group.

The importance of the early recognition and institution of prompt surgical relief has been re-emphasized by Wangensteen and others. McIver has stressed that there are three factors which influence mortality:

1. The degree of injury to the blood supply of the affected loop.
2. The level of the obstruction.
3. Most important, the time elapsing between the onset of obstruction and its relief. That there is an increasing mortality with delay is shown by the fact that in patients operated upon within eight hours the morfality is reported less than 8 per cent, while after forty-eight hours it is recorded as high as 69 per cent.

The symptoms and signs which should lead to early diagnosis are: acute, intermittent, colicky pain usually followed in a few hours with distention and vomiting, with an absence of abdominal rigidity, tenderness, fever and leukocytosis. The importance of auscultation of the abdomen and the visualization of gas in the small bowel or fluid levels has been repeatedly mentioned by Wangensteen. One should not wait to determine the place or character of the obstruction.

Acute gall-bladder disease, hydrops, empyema, gangrene and perforation is the third most frequent acute abdominal lesion. Acute cholecystitis is ordinarily not an emergency. Miller states that it rarely occurs in the absence of stones. Acute obstructive cholecystitis is characterized by a sudden attack of typical radiating biliary colic. Epigastric agony may be intense. Marked rigidity of the right rectus muscle is present with tenderness on palpation. Vomiting is usual. A gradually developing, tender, indistinct mass indicates the spread of infection. Jaundice may be present in the complicated cases. Cases with persistant fever, tenderness and pain should be operated without delay.

The more important conditions which are to be considered in its differential diagnosis are acute appendicitis, obstruction, acute pancreatitis, coronary thrombosis and perforated ulcer.

Pancreatitis exhibits every degree of acuteness. It should be borne in mind in every case of acute abdominal pain with persistant vomiting and collapse. In a series of 232 cases a correct diagnosis was made in only 31 per cent. In view of the high mortality, 51.2 per cent in compiled statistics of 1,278 cases, many surgeons recommend expectant treatment. The dangers of operation beside the immediate operative risk are: secondary hemorrhage, pancreatic asthenia, persistant sinus and ventral hernia. In acute pancreatitis there is severe pain referred to the back or loins, rapid feeble pulse, vomiting, collapse and cyanosis. The upper abdomen is diffusely rigid and tender and there is a high leukocytosis.

Coronary thrombosis usually occurs in males between the ages of thirty-five and fifty-five years. It comes on with severe pain, epigastric or substernal, and is associated with apprehension and prostration. The pulse may be feeble and increased in rate, the face and brow pallid and bathed with sweat. The blood pressure is usually low. The upper abdomen may be full, but there is no marked tenderness or rigidity. There is an early leukocytosis and fever.

Ectopic pregnancy was the fourth most frequent acute emergency in our series. Urdan in a study of a series of cases states that a correct diagnosis was made in only 58 per cent. Except in those cases of severe bleeding the diagnosis may be difficult. The condition occurs usually before thirty-five years of age and pelvic infection is an important causative factor. The classical picture is one of acute abdominal pain followed by collapse, anemia, low blood pressure, subnormal temperature, rapid thready pulse and air hunger in a young woman of twenty-five to thirty-five years of age, who frequently has not had a child for some time and recently has missed one or two periods. With this are signs of early pregnancy, a tender, full, rigid abdomen, sometimes rectal tenesmus and bladder irritability and on vaginal examination a mass on either side of the pelvis.

In our experience, ectopic pregnancy has been confused most often with acute salpingitis or acute appendicitis. The Ascheim-Zondek test may be conclusive. A sedimentation time of thirty minutes or over will indicate ectopic rather than inflammatory disease.

Perforated ulcer is the final major acute abdominal emergency which I wish to consider. In males over twenty years of age, if appendicitis can be excluded, the commonest abdominal emergency is for ruptured ulcer. Moynihan's classical description of this condition is so exact that I cannot do more than repeat it.

"There is intense agony, the face is pale and haggard, anxious and appealing. The eyes wide and watchful. The face bathed in sweat. Respirations short and panting and wholly costal. Words spoken are jerked out in expiration only. The body is rigid and motionless. No movement dare be attempted. If an endeavor is made to touch the abdomen, the patient's hands are at once lifted in protest and in protection. The chest and abdomen remain motionless. The patient is cold, temperature subnormal. The abdomen is immobile and more rigid over the area involved. For the first hour or two the pulse is not

increased or diminished in volume. The blood pressure is normal. There is no shock. After a few hours the temperature and pulse rise. The abdomen becomes fuller. Vomiting begins. Extravasated duodenal contents may trickle down along the right colon to the right lower quadrant and thus confusion with appendicitis may follow."

In subacute perforations the diagnosis may be more difficult.

Probably the most common diagnostic error is in assuming the condition is one of acute appendicitis. Other abdominal lesions which must be differentiated are acute cholecystitis, acute pancreatitis, coronary thrombosis and more rarely mesenteric thrombosis or embolism, dissecting aneurysm and tabetic crises.

In summarizing, I wish to stress that acute appendicitis, obstruction, acute gallbladder disease, ectopic pregnancy and perforated ulcer together make up approximately 95 per cent of all abdominal emergencies; and further, acute appendicitis alone makes up about 75 per cent of abdominal emergencies. Appendicitis may at times be the most easily recognizable condition, and perhaps just as often the most difficult. There is no other field which will test one's diagnostic acumen as in the acute emergency lesions of the abdomen. Even after the most painstaking history, examination and effort to make a correct differential diagnosis there will still be errors committed.

In the words of Maxon:

"We will all make mistakes, even the youngest of us!"

ACUTE APPENDICITIS IN CHILDHOOD*

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MOST parents, and I am inclined to believe a good many physicians still fear the word "appendicitis" in relation to abdominal pain in childhood. Perhaps we are at fault that this state of affairs should still exist, and result in so many disasters. Who of us have not seen children, victims of the diagnosis of enteritis, colitis, stomach "flu," etc., develop peritonitis from a perforated appendix and die?

This exposition concerns itself with acute appendicitis in childhood, and I propose to put it before you from a purely clinical standpoint. Let us deal with this disease occurring under twelve years of age as I feel it differs enough from that seen in older children and adults to warrant our earnest consideration and demand our constant attention. To be sure acute appendicitis is uncommon in infancy, yet after the first year of life it is the most frequent acute surgical condition arising within the abdomen.

The majority of adults suffering from their first attack of acute appendicitis will recover without surgical intervention. On the other hand the same disease in children is exceedingly dangerous because of the frequency and rapidity with which gangrene, perforation and peritonitis occur.

ANATOMY

In the infant the iliocecal apparatus is somewhat higher than McBurney's point, and the cecum is often above the anterior superior iliac spine (Piersol).

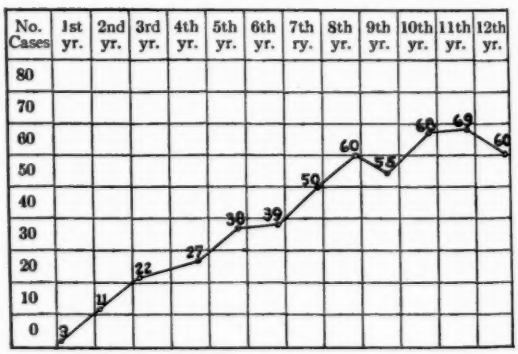
Gundobin noted that in 6 per cent of infants the appendix descended into the small pelvis, and in 22 per cent of the cases was retrocecal.

Christopher states that in the earlier years of life there exists a larger communication between the appendix and the cecum.

During the first two years of life the amount of lymphoid tissue in the wall of the appendix is comparatively small. After the second year this tissue begins to grow, and extend, reaching its maximum growth about the twentieth year.

Always bear in mind that the appendix may lie in an abnormal position, due to incomplete rotation of the bowel, or a mobile cecum.

AGE PERIOD (FRASER)
500 Cases of Acute Appendicitis in Children



AGE INCIDENCE

Under six years of age, acute appendicitis is supposed to be an infrequent disease. However, the number of cases is increasing and one cannot but feel that either the disease is on the increase, or the diagnosis is being made earlier.

Kelly, in reviewing 16,000 cases, found only 2.5 per cent under five years of age.

Diess, on the other hand, reported 25 per cent of his cases under the age of five.

*Read in Symposium on Emergency Surgery at the annual meeting of the Minnesota State Medical Association, Rochester, Minnesota, May 24, 1933.

All statistics show that the first year of life is quite free from the disease. During the second year it is infrequent and after that the incidence rises quite rapidly.

Fraser assures us that no period of life is entirely free from the disease. He had four cases of acute appendicitis in nursing infants.

Fraser's figures show 30 per cent of the cases under six years of age, which is a considerably higher percentage than American statistics show. A review of the British figures indicate that they are diagnosing and operating for acute appendicitis at an earlier age in England than in America.

ETIOLOGY

Fraser points out that the explanation of the age incidence in childhood may be found in several facts.

1. By the relative amount of lymphoid tissue present in the appendix at different periods of life.

2. By the fact that the toxicity of the intestinal flora alters as the child grows older. In most cases the Bacillus Coli is the responsible organism. Soon after birth its virulence is comparatively slight, but as the child grows older the virulence is stimulated by the increasing complexity of the diet and by the incidental attacks of gastroenteric catarrh.

3. Influences of terminal blood supply and the gastroenteric infections from carious teeth are also applicable in children.

Bolling believed that sex had no influence, and was convinced that a frequent cause of necrosis and perforation was a fecolith.

Porter reported that in 60 per cent of his cases there was a history of tonsillitis.

In 1909 Frasac emphasized "indisputable relationship of cause and effect between affections of the nasopharynx and the appendix." He thought that the infection was transmitted by the digestive tract or the blood stream.

Infectious diseases, familial predisposition, and mechanical causes, such as kinks and twists, are thought to have an etiological role.

Abt believed that traumatism and diseases of the alimentary tract played a role. He warned us to watch for appendicitis during and after tonsillitis, and the acute exanthemas, especially measles.

In gangrenous appendicitis worms are not common, and very little proof can be found that gangrenous or suppurative appendicitis results from parasitic infection (Howland).

Thus a review of the literature reveals that the exact etiology of appendicitis is still very much in doubt.

DIFFERENTIAL DIAGNOSIS

The problem of differential diagnosis in children is always more difficult than in the adult. A few conditions occur in the adult which never need consideration when dealing with children. On the other hand many conditions occur in children which may be mistaken for appendicitis. I shall attempt to classify the most important of these conditions, and enumerate the points which are of aid in the differential diagnosis.

1. CARDIO-RESPIRATORY SYSTEM:

A. *Pneumonia.*—When dealing with young children an aphorism of Trousseau's should always be kept in mind. "Whenever a child complains of pain in the abdomen, examine his chest."

Because of the frequency of pulmonary disease in young children, appendicitis is often thought to be pneumonia. In older children pneumonia is often thought to be appendicitis, and many unnecessary operations have been done because of this error.

Adam and Berger stated that twenty-five patients out of one hundred and forty-five with lobar pneumonia were sent to the Boston City Hospital with a diagnosis of appendicitis. The diagnosis was based on abdominal pain, tenderness, vomiting, fever, and a p.m.n. leukocytosis.

Howland states that the child with pneumonia looks sick, his cheeks are flushed, ali nasi are at work, the respiratory rate is increased and the breathing may be grunting in character and is always abdominal in type. He is restless and irritable, his temperature is usually above 101, and the leukocyte count is usually over twenty thousand. The child with appendicitis has a pale facies, he lies quietly in bed and ordinarily dislikes to move his right leg, and respiration is costal in type.

Well defined general symptoms of primary lobar pneumonia do not necessarily mean well defined physical findings. When the lesion is central in character the physical findings are usually late in appearing.

The abdominal tenderness of pneumonia is so superficial and so little influenced by deep palpation that it suggests hyperesthesia. Likewise the tenderness is less marked than the pain.

In border-line cases I have found the x-ray of extreme value in helping to diagnose central pneumonia.

B. *Throat Infections.*—Abdominal pain is a frequent complaint either in sporadic or epidemic forms of sore throat. Certainly in some cases it is the most prominent symptom.

Brenneman thinks that this is the most frequent single abdominal pain encountered in childhood beyond the period of infancy. He says the pain is commonly paroxysmal, sometimes mild, and sometimes severe. The pain is usually greater than the tenderness, the reverse of appendicitis. We must never forget however that acute appendicitis is frequently a complication of upper respiratory infection.

C. *Pericarditis.*—Pericarditis can produce acute abdominal pain, but it is extremely rare. The enlarged precordial area and friction rub should be picked up on general examination.

2. GASTRO-INTESTINAL SYSTEM:

A. *Colic.*—Brenneman states that colic is the most frequent, most distressing and easiest recognized of abdominal pains of infancy. Its early age incidence places it at a time when other severe pains are infrequent. Its paroxysmal character, daily periodicity, varying, agonizing course, and sudden departure, improvement when pressure is applied, complete relief when flatus is expelled, and lack of fever leave no

doubt as to the diagnosis. Real major colic is always intestinal in origin.

B. *Chronic Indigestion.*—Again Brenneman tells us that babies with chronic indigestion cry a good deal from abdominal distress. The condition is usually constant, not as severe as colic, and usually is accompanied by evidences of dyspepsia such as diarrhea. These babies pass gas and feces and cause no concern as to the presence of intestinal obstruction.

C. *Ileo-colitis.*—In this condition the tenderness is not localized. Fever is rare. Vomiting usually stops when the stomach is empty. Diarrhea precedes pain and there is no leukocytosis.

D. *Cyclic Vomiting.*—To differentiate cyclic vomiting from acute appendicitis may be extremely difficult, but to operate unnecessarily during a vomiting crisis may result in disaster.

E. *Constipation.*—Constipation can be ruled out by history and rectal examination.

F. *Pyloric Stenosis.*—Age is against appendicitis. Projectile type of vomiting is not seen in appendicitis. Pain is seldom severe. These babies usually fuss and squirm from discomfort which is present with visible gastric peristalsis.

G. *Intussusception.*—The type of pain is characteristic. Infant usually squirms and changes position at regular intervals. Blood and mucus are in the bowels without the presence of fecal material. Palpation of a sausage shaped tumor clinches the diagnosis. This condition usually occurs in the first year of life with sudden onset and considerable degree of shock.

H. *Intestinal Obstruction.*—Intestinal obstruction due to a volvulus or a band is rare in childhood. A tight anal sphincter may give abdominal distension and pain. The x-ray will be of value.

I. *Acute Mesenteric Lymphadenitis.*—In this condition I do not believe that a positive diagnosis can be made. The tendency is for it to disappear following laparotomy. Even when this condition is suspected I think operation should be performed for fear it may be present.

J. *Cholecystitis and Pancreatitis.*—As yet we are unable to make a differential diagnosis in these conditions, but fortunately they are very rare.

K. *Primary Peritonitis.*—This condition may be due to pneumococcus, staphylococcus, streptococcus, or gonococcus. A differential diagnosis is impossible without some operative procedure.

L. *Tuberculous Peritonitis.*—The clinical features are obstructive symptoms, severe colicky pains and marked distension.

M. *Meckel's Diverticulum.*—This condition must always be thought of and looked for when operating for acute appendicitis. Differentiation is unlikely.

3. Genito-Urinary System:

A. *Pyelitis.*—The pain and tenderness may simulate retrocecal appendicitis. Marked tenderness may be present in the kidney region but is usually absent. Rigidity is not present. Temperature is higher than physical signs indicate, and usually saw-tooth in type. Painful urination with pus in the urine may occur in appendicitis. A single specimen without pus does not exclude pyelitis, and more than one specimen should be examined in doubtful cases.

B. *Ureteral Stone.*—If in doubt search for blood in the urine, and x-ray the suspicious region.

C. *Distension of Bladder.*—Smooth pear shaped tumor will be present. Catheterization will rarely be necessary.

4. Infectious Diseases:

A. *Measles.*—Helmholz urges us to constantly have in mind the abdominal prodromes of acute infectious diseases. Many a child with measles has been operated upon for appendicitis. We should always think of measles and be sure of appendicitis. Koplik's spots should be looked for, and likewise a leukopenia. Appendicitis complicating measles is serious.

B. *Typhoid Fever.*—Rose spots, Widal reaction, bacilli in stools, and leukopenia without an increase in the polymorphonuclears are your guides.

5. Structural System:

A. *Tuberculous Spondylitis.*—The tenderness and rigidity of the spine always precede any abdominal symptoms. X-ray.

B. *Osteomyelitis—Ileum or Femur.*—Pressure on the bone is extremely painful. Temperature and leukocyte count are very high. X-ray.

C. *Acute Suppurative Arthritis, Right Hip.*—These cases have been mistaken for appendicitis. Movement of joint is extremely painful. Careful history, observation and examination. Royster says, "Remembering that appendicitis is an abdominal disease is the solution."

The literature mentions cysts of mesentery, cysts of omentum, dermoid cysts with twisted pedicle, ovarian cysts with twisted pedicle, salpingitis, torsion of omentum, torsion of undescended testicle, retroperitoneal abscess in iliac fossa, inguinal and femoral adenitis, meningitis, pyelonephritis, and vomiting of acidosis.

DIAGNOSIS

My feeling about the diagnosis of acute appendicitis in children is that it is an abdominal crisis which, as Adams states, requires the mind of a physician to diagnose and the hands of a surgeon to treat.

Late recognition of this disease, in children, rather than its rapid course and lack of resistance, is probably the cause of our high mortality. The urge to procrastinate is always present in the case of children in the hope that it may not be appendicitis.

I tmust also be appreciated that it is a difficult problem to diagnose appendicitis in children, especially under six years of age. Yet it is a problem which confronts, and must be met by, every physician. Frequently the diagnosis is made when the child is suffering from some other ailment, but more often the diagnosis is not made when the child is actually suffering from appendicitis. We can readily appreciate that subjective symptoms in young children are not very reliable, and that objective symptoms are usually difficult to elicit and evaluate.

When the disease is still confined to the appendix the appearance of the child may be one of comparative well-being.

Farr states that the present status of our ability to make a diagnosis in young children may be likened to our ability to make the diagnosis in adults 35 years ago.

A history of previous attacks should never be relied upon too much in young children. Never permit a child to have a second attack of appendicitis. If you suspect appendicitis observe the child every two hours. Any child with abdominal pain and vomiting must be considered a potential case of appendicitis.

Most writers believe that the onset is gradual, while some feel that it may be sudden. From my experience I am inclined to believe that the disease has a gradual onset.

In spite of the fact that the disease is uncommon in young children it must be considered in every case of obscure illness.

Howland says, "It is trying to the patient, the family, and the physician, nevertheless we must make a thorough examination, in order that we may properly treat the case."

SYMPTOMS

Pain.—I believe that pain is always present, although the child may deny it because of fear of the "Doctor." The pain, at first, is usually generalized. It may be referred to the back, the pelvis, or upper abdomen, but ordinarily is present in the region of the umbilicus. The pain in most instances is paroxysmal in character, but it may be continuous. The young child invariably calls it a "hurt."

In Bolling's series pain was the initial symptom in 90 per cent of the cases.

Muller and Ravdin say:

> "Many writers on the subject have erroneously stated that the pain of appendicitis in children varies because of the variation in position of the appendix, depending as it does on the rotation of the colon and the descent of the cecum.
>
> "This is fallacious, however, since the appendix receives its nerve supply through the abdominal sympathetic in embryonic life. This innervation is constant and does not depend upon the anatomic position of the appendix. Disturbed action of the sympathetic nervous system as the result of a lesion in the appendix is the chief cause of the symptoms as long as the inflammation is localized to the appendix. The sympathetic fibers make constant connections with the various spinal segments. Since the sympathetic nerves do not contain fibers, the sensation of pain is in some way associated with a reference of the stimulus to the cutaneous distribution of the spinal nerves, with which the sympathetic makes its central connection.
>
> "Tension within the appendix probably initiates the stimulus that calls forth the sensation of pain in the distribution of the tenth and eleventh intercostal nerves. Pain is therefore first referred to the region of the umbilicus.
>
> "When inflammation spreads to the surrounding structures the pain is felt in whatever location the appendix is. This secondary pain is the one that is diagnostic of the exact location of the appendix. The secondary pain is an expression of an irritation of the somatic sensory nerves, the result of inflammation of the subperitoneal tissues."

Holt says that restlessness. irritability, and the character of the child's cry are useful in the determination of pain.

Drachter called our attention to the fact that children, be they ever so ill with pneumonia or other febrile diseases, usually sleep for long stretches; but the child with abdominal pain will not sleep, and will not let anyone else sleep.

The pain is of moderate severity, but if peritonitis be present it may be increased with urination or defecation. Churchman reported a case that was sounded for stone because of painful voiding. I recall a case where the outstanding symptom was pain on urination. The child presented a perforated appendix.

If the child can assume the sitting position without making the pain worse, it speaks against appendicitis. If the child limps when allowed to walk, be suspicious of abdominal pain, but watchful for an acute process in the region of the right hip joint. When constant and moderate pressure is applied over McBurney's point, raising the right leg with extended knee increases the pain.

In my observations the child usually lies on the right side, with the right knee drawn up, which relaxes the psoas muscle and thereby lessens the pain.

Among practitioners of children's diseases it is a well recognized fact that children do not ordinarily complain of pain unless it is quite severe. Perhaps under six years of age the human organism is not as sensitive to pain. In many cases of appendicitis, no doubt, the average child has had abdominal pain long before he complains of it. Hence we must be conscious of this fact and give it due consideration when taking the history.

An adult complaining of pain may not have any pain at all, but the child complaining of pain has pain, and it is our task to find the cause.

I feel that abdominal pain is the most constant symptom of appendicitis in children and must never be considered lightly.

Fever.—In children the temperature is moderately elevated in an attack of appendicitis. It will range between 99 and 102. A temperature over 102 should be a warning to look for a cause other than simple acute appendicitis. On the other hand, never be misled by absence of temperature because gangrenous appendicitis may be accompanied by a normal or even subnormal temperature. As an aid in a differential diagnosis I do not think that much reliance can be placed upon the temperature reading.

Leukocyte Count.—The leukocyte count is usually elevated, ranging between 12,000 and 18,000 with a definite polymorphonuclear increase. A count over 20,000 leukocytes in a supposed case of appendicitis, without complication, should be looked upon with suspicion. The same holds true regarding a normal leukocyte count as was said for temperature in cases of gangrenous appendicitis.

The explanation of normal temperature and leukocyte count in cases of gangrenous appendicitis is found in early thrombosis of the mesoappendiceal blood vessels, preventing absorption of toxins into the general circulation, and therefore preventing general systemic reactions.

In doubtful cases I believe that the differential count

is of greater value than the total count, a leukopenia without an increase in polymorphonuclears usually excluding appendicitis.

Vomiting.—Vomiting is nearly always present but very rarely is persistent. Ordinarily vomiting occurs once or twice and usually succeeds the onset of pain.

Bolling reported three cases without pain, the attack being initiated by persistent vomiting. In four of his cases vomiting did not occur at all.

Holt believed that vomiting was probably the most constant symptom.

Of Beckman's forty-three cases under five years of age, thirty-six began with vomiting.

On the other hand, Abt says that vomiting occurs so frequently in the gastro-intestinal, nutritional, and toxic diseases of infants, that very rarely can it be considered pathognomonic. To be sure, vomiting can not be considered pathognomonic of appendicitis, but it plays its part in the picture.

Disturbed Bowels.—Constipation occurs rather frequently, diarrhea is rather infrequent, but normal bowel movements, in my experience, are by far most common.

Howland reminds us that when the stool contains mucus we must not be satisfied with the diagnosis of enteritis, or dysentery.

Tenderness.—Abdominal tenderness is practically always present; rarely is it difficult to elicit in children over three years of age. In my experience with appendicitis in children, I have had only one case without tenderness.

Localization of tenderness may be difficult, but by careful, gentle, and tactful palpation the paient will nearly always tell you that it "hurts" more on the right side than the left. The tenderness may be apparently as severe in the uppper right quadrant as in the lower, but as you gain the patient's confidence, you will in most instances be able to determine that the real tenderness is in the lower right quadrant. If, however, the child repeatedly insists that one part of the abdomen is as tender as another, peritonitis may already be present.

Holt thinks that it is practically impossible to localize tenderness under three years of age, and I agree with him.

Helmholz and Bolling believe that definite tenderness in the right lower quadrant in the region of McBurney's point is the most conclusive single bit of evidence in making the diagnosis of appendicitis in children.

Bolling in all cases but one found tenderness. He says that if tenderness is corroborated by pain, vomiting, elevation of temperature. and leukocyte count, the diagnosis is reasonably sure. When, however, he can convince himself that there is no local tenderness, he hesitates to make a diagnosis.

A retrocecal appendix, one in the pelvis or extending across the midline, makes the evaluation of localized tenderness difficult. Occasionally tenderness may only be elicited by rectal examination.

Rebound Tenderness.—Rebound tenderness, when present, is a valuable sign of peritoneal involvement. I recently saw a ten-year-old girl in whom the only positive abdominal finding was rebound tenderness. Operation revealed beginning peritonitis.

Rigidity.—Muscular rigidity can be obtained as easily in older children as in adults, but in young children it is more difficult to determine. In the crying child under three years of age it is impossible to determine.

Howland believes that when it is found it is perhaps our most reliable symptom of acute appendicitis in children.

Palpation should never be started until you have gained the child's confidence. Learn his given name and use it. Commence on the left side, never using more than the finger tips, and always be gentle. Deep palpation early in the examination will nullify all palpatory findings. You have hurt the child and at once he becomes fearful of all further examinations. It should be withheld until the end of the examination, and then used only to determine the presence of a tumor. Occasionally if the tumor mass is low down it can only be palpated by rectal examination.

Cope states that rigidity is a common sign, not of appendicitis, but of the accompanying parietal peritonitis.

Tympanites is indicative of extensive peritoneal involvement.

Spasm.—Muscular spasm is an unreliable sign in children.

TREATMENT

Acute appendicitis in children is an emergency surgical disease, to which rule there is no exception. The most experienced surgeon cannot tell the outcome in these cases. In those cases in which the suspicion is strong, but an absolute diagnosis cannot be made, I believe an exploratory operation is justified. The risk of a well done operation is not comparable to a neglected case.

Helmholz said, "It is better to operate on an occasional pneumonia thought to be appendicitis, than to let an acute appendicitis go to general peritonitis."

I believe entirely with Drachter when he says that the problem of appendicitis in the young child is chiefly one of diagnosis, and if operation is performed before there is general peritonitis or pocketing of pus, the mortality should be no greater, but should be even less than in the adult.

A child with abdominal pain should never be given a cathartic. Starvation and enemas should be the order of the day.

OPERATION

In abdominal operation on children, always bear in mind that gentleness and hemostasis are of utmost importance and should never be sacrified for speed.

I employ the right rectus muscle splitting incision because I believe that it is safer when extensive disease is encountered, and likewise facilitates exploration when it becomes necessary.

Moist abdominal packs must be kept as near body temperature as possible. Cool packs increase the element of shock and consequently produce added risk to your patient's life.

Of late I have not practiced inversion of the stump. Ligation of the crushed base with chromic I gut and the usual phenol, alcohol treatment of the stump I am convinced is sufficient. My experience with this procedure has been favorable and I believe that it eliminates any future trouble in the wall of the cecum such as cysts or tumors. Do not attempt to cover the stump with the mesoappendix if such a procedure is going to affect the efficiency of the ileocecal valve.

Children under twelve years of age who show any evidence of peritonitis should be drained. For drainage soft rubber tissue will answer all purposes. Under no circumstances should gauze or hard rubber tubing be used. Do not close the wound too tightly about the drainage material. Multiple drains are not necessary; one to the ileocecal region and one in the pelvis are sufficient.

Ether administered by the "open drop" method is the anesthesia of choice.

POSTOPERATIVE CARE

Normal saline solution should be given as soon as the child is returned to bed. If the child presents any degree of dehydration give the fluid by hypodermoclysis, otherwise proctoclysis will suffice. Give at least 1000 to 1500 c.c. during the first twelve hours, and continue until sufficient fluid is being taken by mouth. Remember that proctoclysis is not satisfactory for any length of time in infants, but is well tolerated by older children. Bolling recommended giving 3 per cent glucose solution by hypodermoclysis, but in my experience I have not found it necessary.

Bear in mind that children do not tolerate starvation, and some nourishment should be given during the second twenty-four hours.

As a rule very little sedative is required for children, and usually chloral hydrate or codein suffices.

Distention should be treated with repeated small enemas, gastric lavage, or nasal decompression.

Persistent vomiting responds very well to gastric lavage.

CONCLUSIONS

1. Observation and thorough examination are extremely important whenever a child complains of abdominal pain.

2. Any child with abdominal pain, vomiting and fever should be considered a potential case of appendicitis until proved otherwise.

3. The cardinal diagnostic points in order of importance are: (1) Localized tenderness; (2) muscular rigidity; (3) abdominal pain; (4) vomiting; (5) leukocytosis; (6) temperature.

4. Acute appendicitis in a child is always a surgical problem.

5. Late diagnosis and cathartics are responsible for perforation, morbidity, and high mortality.

STRANGULATED HERNIA*

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STRANGULATED hernia is first mentioned in the writings of Hippocrates who lived four centuries before Christ. Our first record of treatment dates back to the third century before Christ. It was Parxagoras of Cos who at that time believed that the cause of strangulation was due to an accumulation of hardened feces in the protruding intestine. He advised taxis for its relief.

The treatment for strangulated hernia up to the sixteenth century was for the most part the use of taxis and adjuvants of taxis such as antispasmodics, cold compresses, warm baths, or fomentations to the abdomen. Opium and ipecac were also used. In the seventeenth or eighteenth centuries venesection became popular. At about this period tobacco came into rather common use, not, however, in the manner that it is used today, for we find that tobacco enemas and injections of smoke into the rectum by means of bellows were used to produce general depression. The symptoms of this depression were weak pulse, nausea, cold sweats, and fainting, all of which were supposed to reduce the strangulation. The writings of those days show that many of these patients died but do not state whether death ensued as a result of the strangulated hernia or whether it was the result of tobacco poisoning.

It was Maupasius, in 1559, who performed the first operation for strangulated hernia, but apparently Pierre Franco developed the best operation up to his time in the sixteenth century. After exposing and reducing the hernia, he cut off the sac, retracted the edges, stopped the hemorrhage, and used caustic to produce scar tissue.

In the years that followed we find minor improvements made from time to time by such men as Dionis, Albert, Petit, Richter, Wutzer, and many others. Needless to say, following the work of Pasteur and Lister more progress was made between 1870 and 1890 by open operation than in all the preceding centuries.

Let us consider for a moment the statistics regarding strangulated hernia. According to my colleague, Dr. Paul Kelly of St. Paul, who spoke before this association in 1922, 2 per cent of some 500,000 men examined for industrial concerns were found ruptured, and of

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those operated upon, less than 1 per cent had strangulation at the time of operation.

Listing hernias as to frequency of strangulation, we have the following order: (1) femoral; (2) umbilical; (3) inguinal; (4) ventral; (5) diaphragmatic.

Mr. Kingdom of London reports 6.7 per cent males compared with 1 per cent females ruptured, but the percentage of strangulation from hernia is much higher in women. In fact Berger found 14.06 per cent of hernias strangulated in women as compared to 3.61 per cent in men. This is probably accounted for by pregnancy and obesity as well as the higher percentage of umbilical hernias in women.

The age incidence of strangulation shows it to be more common in the old and middle aged; it is rare in infants, infrequent in children, and occurs rarely before the age of twenty.

Reviewing the herniotomies performed during a five year period at St. Joseph's hospital, Saint Paul, by the staff members, I found the record of 649 operations, forty of which (6.16 per cent) were for strangulation.

Twenty-four of these forty were in males and sixteen in females. Twenty were inguinal, thirteen femoral, four ventral and three umbilical.

Twenty-nine of the forty were operated upon within twenty-four hours of the first symptoms of strangulation, five within forty-eight hours, one in ninety-six hours, one in seven days, and in four no history was obtained.

Nineteen had bowel alone within the sac, eleven had bowel and omentum, eight had omentum alone, one had stomach, hepatic flexure, transverse colon, and descending colon, and one had transverse colon, testes, and omentum.

It was not necessary to resect bowel in any of the thirty-two cases where bowel alone, or omentum and bowel, were present. In five of the forty cases it was necessary to resect omentum. Four of these five were cases where omenutm and bowel were present together and one where omentum alone was present.

In the forty cases, thirty-one stayed for an average of fourteen days. In three cases the hospital stay could not be determined. Death occurred in six instances and was attributed to shock, peritonitis, pneumonia, coronary occlusion, and intestinal obstruction.

Immediate operation must be performed in case of strangulation, and under no circumstances should taxis be attempted. I feel that I should apologize to this body for this self-evident statement, and yet, only six months ago, I saw a patient in whom taxis had been attempted with disastrous results.

Every surgeon has his own opinion, based on experience, regarding anesthesia in these cases. Nitrous oxide and ether must still be regarded as the most reliable. Spinal anesthesia at times is excellent but must be used with caution. Local anesthesia is questionable in that there is danger of infiltrating an inflamed field; furthermore, the hernial sac in these cases is usually edematous and thickened, frequently containing serosanguineous fluid. It is oftentimes difficult to recognize the structures and infiltration of novocain is apt to make such recognition even more difficult than ever.

A primary bowel resection in cases in which the bowel is gangrenous has been attended, in our experience, with a high mortality. In such cases the bowel should be exteriorated and opened. It must be definitely ascertained that the proximal loop is not constricted at the inner ring or within the canal, so that free drainage of intestinal contents is assured. These patients are always in poor condition, and it is useless to attempt to do very much. If the patient survives the primary operation, it is rather an easy matter to resect the bowel and reëstablish its continuity.

I wish to report the following case through the courtesy of one of the staff surgeons at St. Joseph's Hospital.

CASE REPORT

Mr. K., aged seventy-four, when first seen complained of terrific abdominal pains and nausea.

On examination he was found to be poorly nourished and seemed very ill. Retching was persistent. A tumor mass about the size of a hen's egg was present in the region of the right femoral ring.

Operation.—Under spinal anesthesia, the knuckle of intestine was exposed and found to be protruding from the femoral ring. It was very difficult to see the margins of the hernial ring, even though relaxation was complete. In an attempt to enlarge the femoral ring a sudden rather outspoken hemorrhage occurred which was thought to be due to a laceration of the deep epigastric vein. The blood vessel wall in which the rent was produced was sutured with fine plain cat gut and this seemed to control the hemorrhage. The operation was completed in the usual manner.

Within the first twenty-four hours after the operation the patient complained of a great deal of pain in his right leg, and it then became apparent that either the femoral vein or artery had been injured instead of the deep epigastric vein. The patient's condition grew suddenly worse. Abdominal distention and symptoms of peritonitis developed. Due to his age and general condition, surgical intervention seemed inadvisable without inviting certain fatality. The absence of vomiting, too, suggested the absence of intestinal obstruction. The pain in the leg continued but there was not a great deal of evidence of circulatory disturbance, such as discoloration, although there was some edema and swelling. Seventy-two hours following the operation the patient died.

At postmortem examination there was evidence of a low grade peritonitis. The portion of the bowel which had been obstructed and which was within the hernial sac before the operation was seen lying loose in the abdominal cavity and free from obstruction. However, about eight inches proximal to this area the ileum had become attached to the parietal peritoneum below and to the inside of the femoral ring area which had produced a complete obstruction with distension proximal to this area.

In the region in which the blood vessel repair had been made, it was found that the femoral artery for a distance of one inch had been lacerated. The sutures were holding, but a thrombosis had occurred in the lumen at this point which apparently had produced an almost complete occlusion and was responsible for the circulatory disturbance in his right leg.

The question arises in cases of strangulated femoral hernia whether the reduction should be performed from without or within the peritoneal cavity. In this particular case there is no doubt in my mind that if the operation had been done from within, the obstruction from which he died could have been corrected or prevented, and, surely, the injury to the blood vessel could undoubtedly have been avoided.

In two cases of strangulated inguinal hernia which I operated upon recently the loop of bowel was firmly adherent to the neck of the sac. The bowel was very dark in color and friable. I was unable to release it without fear of laceration or perforation. Even though there was considerable bloody fluid in the hernial sac, I did not hesitate to open the abdomen, and with one finger in the hernial ring and the other hand in the abdomen, I was able to free the adherent bowel and pull it into the abdominal cavity. In this way it was an easy matter to note the peristalsis of the bowel and to determine its viability. In both these cases it was unnecessary to resect. The abdomen was closed, and the hernia repaired in the usual manner with eventual complete recovery.

Dr. W. C. Carroll of Saint Paul informs me that in his cases of strangulated femoral hernia, he cuts Poupart's ligament a distance of one-half inch from the pubic bone. This gives excellent exposure, opens the canal, and eliminates the danger of injuring the large blood vessels.

CONCLUSIONS

1. Strangulation of a hernia is becoming less frequent because of herniotomies properly performed.
2. Resection of the bowel in strangulated hernia is becoming less necessary because of early recognition of the condition and early operation.
3. The surgeon should not hesitate to open the abdomen if he encounters any difficulty in reducing an adherent bowel which has commenced to become gangrenous in the case of strangulated femoral or inguinal hernia.

CASE REPORTS

PELLAGRA FOLLOWING LACK OF ANIMAL PROTEIN*

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Occasional cases of pellagra are seen in the Northwest. O'Leary[1] at the Mayo Clinic encountered seventy-six during the past five and one-half years. The Minneapolis General Hospital, for approximately the same period, reports fifty-four cases, while the Minnesota General does not average one a year. The latter hospital cares largely for rural patients and does not encounter the alcoholic type which makes up the bulk of the city cases. In the State of Minnesota there were thirteen pellagra deaths reported during the past five years. This rate is slightly higher than for the preceding years.

Pellagra may be roughly divided into three classes: (1) simple or dietetic pellagra; (2) post-alcoholic pellagra; (3) secondary pellagra. Judging from the cases reported in the literature,[2] the last two classes approach simple pellagra in frequency in this area. Simple pellagra, especially the acute form, is quite rare when compared with the thousands of such pellagrins encountered in the South. These dietetic cases result from an unbalanced diet, especially lack of meat, milk and fresh vegetables. The post-alcoholics are not uncommon. Sweitzer[3] reports 55 cases. They all gave a history of chronic alcoholism, their pellagra usually being precipitated by a prolonged debauch during which they ate very little. Among the secondary pellagras, we have largely lesions which produce a dysfunction of the gastro-intestinal tract. Esterman and O'Leary[4] have reported a series following obstructive lesions, both benign and malignant, of the upper intestinal tract.

Much still remains to be learned about the etiology of pellagra, but the generally accepted opinion is that it is due to a deficient diet, an avitaminosis. Following the work of Goldberger and associates[5] in 1926, it appeared that a specific factor in the diet had been found. This was called the P-P factor or pellagra-preventative (now termed Vitamin G or B_2, the latter term being used by the English brochemists). At this time the dual nature of the old water-soluble Vitamin B was demonstrated. One part was shown to be thermolabile with growth promoting and antineuritic properties. The other part of Vitamin B was relatively stable and capable of preventing and curing pellagra-like symptoms in the rat. It was found that dried yeast and lean beef were especially rich in this antipellagric factor. Recently, more reluctance has been shown in accepting the lack of a single food factor as the producer of the complex clinical picture of pellagra. That Vitamin G deficiency is intimately associated with the production of pellagra seems quite certain, but it does not appear to be entirely responsible in the uncontrolled human case. There often appear to be contributing factors, best exemplified in the secondary pellagras, whose true rôle we do not know.

The following case of pellagra developed while the patient was under treatment for tuberculosis from which she subsequently died. Because of the presence of tuberculosis and also diabetes the case cannot be classified as strictly a dietetic one. However, it is the dietary side of the case that makes it of interest.

CASE REPORT

The patient, white, female, aged sixty-eight, was admitted to Fairview Hospital December 11, 1931, because of chronic pulmonary tuberculosis with bilateral cavitation. The patient was not acutely ill but the prognosis was unfavorable. Past history was of no significance.

The patient was a small, high-strung, elderly lady, moderately emaciated. Chest findings were those of advanced tuberculosis. The motor system was normal.

Laboratory Data.—Sputum, positive for tubercle bacilli. Blood: Hb. 89; RBC 4,670,000; WBC 13,100. Urine: sugar 4+; albumin, trace. Blood sugar 400 mg.

The patient was placed on bed rest régime, given insulin (18 units) and diabetic diet (C 154, P 70, F 182). She was a strict orthodox Jewess and would

*From the Glen Lake Sanatorium, Oak Terrace, Minnesota.

touch nothing but kosher meat. Her relatives brought her kosher food occasionally. Her appetite was fair, but it had always been rather finicky.

About a year and a half later (April 5, 1933), the patient was transferred to Glen Lake Sanatorium. Her pulmonary condition had been running the typical slug-

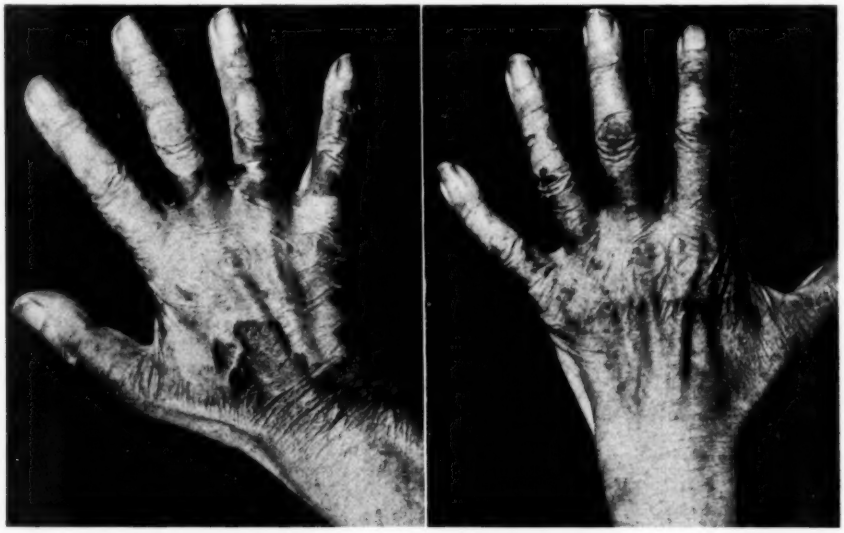

Fig. 1. Pellagra. Appearance of lesions six weeks after onset.

gish but slowly downward course of the aged consumptive; her glycosuria and hyperglycemia, however, had disappeared. Insulin was stopped. A diabetic diet (C 132, P 70, F 120) was maintained for a month and then discontinued. She was allowed bathroom privileges.

Her relatives came out infrequently now. This meant no kosher food, and as a result she was eating very little meat. We did not show immediate concern about this, because she was getting milk three times a day, eggs three times a week, and fish and chicken occasionally.

But, two months after admission, she began to develop the typical skin manifestations of pellagra on the dorsum of the hands. The tongue showed an atrophic glossitis, but was not sore. She had no gastrointestinal symptoms except that her stools at times were softer than normal. Neurological examination revealed some evidence of posterolateral degeneration. Both patellar reflexes were absent, the lower extremities were quite weak, and there were areas of parathesia over the arms and hands. Mentally, the patient appeared very anxious about herself.

Laboratory findings at this time: Blood: Hb. 79; r.b.c. 4,790,000; w.b.c. 17,000; p.m.n. 78; lympho. 18; l. mono. 2.5; e.o.s. 1.5. The red cells were normal in appearance. Urine negative. Gastric expression with histamine showed absence of free HCl.

With the appearance of the gauntlet dermatitis we arranged to get kosher meat daily. The value of lean beef was stressed. Yeast and dilute HCl were given. Improvement followed. The skin lesions exfoliated and cleared up in a few weeks, leaving the underlying areas thin and dry. Mentally she became less apprehensive and more cheerful. Her achlorhydria persisted. The neurological findings remained practically the same.

About three months later (October 24, 1933) the patient died from massive pulmonary hemorrhage. Autopsy permission was not granted.

On carefully checking back over the food actually eaten we found that the patient had been consuming a fairly well balanced diet except for a definite deficiency in animal protein.

There were two possible contributing factors aside from the diet, namely, tuberculosis and diabetes. It has long been observed that patients suffering from diseases which disturb metabolism are especially prone to pellagra. Pulmonary tuberculosis is frequently associated with pellagra, especially in regions where pellagra is endemic. The diabetes in this instance was probably only an incidental finding.

Deficiency diseases following adherence to certain religious beliefs regarding diet have often been observed. Night blindness occurring among orthodox Russians during lenten fasts was described in 1887. Knickknack eaters or individuals with peculiar phobias regarding foods are apt to develop pellagra. Carley tells of pellagra in a woman who feared certain foods would cause cancer. Her diet in time became reduced to cooked cereals. I could find no report in the recent literature of a case similar to the one described above.

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CASE OF PILONIDAL SINUS IN A NEGRO

W. A. Fansler, M.D., F.A.C.S., and
James K. Anderson, M.D.
Minneapolis

This case is of interest due to the fact that to date there has not been a single case of pilonidal sinus reported in the negro race. G. W. Horsley, Richmond, Virginia, in reporting a series of cases, calls particular

attention to this fact. The case in question was that of a young negro girl fifteen years old who was admitted to the Minneapolis General Hospital, June 6, 1933, complaining of an abscess above the rectum, with pain on walking or sitting down. She gave a history of having had a similar swelling and soreness in the fold between the buttocks five months previously, which had spontaneously ruptured on two or three occasions, drained for some days, then apparently closed.

Examination revealed a moderate swelling 4 cm. in diameter over the sacrococcygeal articulation, somewhat to the left of the midline. Diagnosis: Pilonidal sinus, infected. June 7, 1933, under infiltration anesthesia the abscess was incised with the escape of about 2 ounces of foul pus. The inflammatory area was then excised by a wide margin and the wound allowed to heal by granulation. The tissue section did not show any cyst wall but much inflammatory proliferation. One small bit of isolated squamous epithelium was found at the bottom of the abscess cavity. Owing to the length of time which the inflammatory process had existed, I think it is to be expected that any cyst lining would have been destroyed and also any hair that might have been present.

In going over our series of pilonidal sinuses, now numbering ninety, of which sixty-four have had radical block excision (twenty cases reported in 1930) this is the first case in a negro. Supplementing our report in 1930, we still feel that this lesion, etiologically, is a fetal defect involving only the epithelial covering with a subsequent infection causing an inflammatory reaction which is the usual cause of a visit to the surgeon. We feel that a pilonidal sinus is an unfolding of skin to a greater or lesser extent, the minimum being in cases which present merely a post anal dimple, the more extensive cases resulting in skin lined sinuses an inch or two long. It certainly originates from the skin although the skin lining the tract is not always typical. In many cases, however, the hair follicles continue to function, resulting in the presence of numerous long hairs.

This additional series of forty-four cases which we are now reporting as having been operated since 1930, still give a history of having been operated one or more times previously due to lack of removal of the basic disease. There were twenty-five males (57 per cent) and nineteen females (43 per cent) including one negro.

At the present time there is an admixture of white blood in many of our negroes. Judging from her color, this patient probably had a mixture of one-eighth of white blood. It is an interesting speculation as to whether pilonidal sinus ever occurs in a person of pure African descent. The fact that this condition may not exist, or at least very infrequently, in the African strain, may possibly be of some interest to the anthropologists.

FOREIGN BODIES IN THE URINARY BLADDER

G. O. Fortney, M.D.
Zumbrota, Minnesota

It is interesting to note the variety of foreign bodies that have been found in the urinary bladder. Bransford speaks of calculi, pieces of suture, broken catheters or bougies, parts of a lead or slate pencil, toothpicks, crochet needles, straws, glass tubing, beads, wax, chewing gum, and hair pins. Kelly mentions foreign bodies entering through the peritoneal covering of the bladder from the tubes or ovaries, as well as from the vagina. Echinococcic cysts have ruptured into its cavity; dermoid cysts have discharged large quantities of hair into the bladder cavity; pessaries, left in the vagina, have set up an ulceration and worked their way through the vesico-vaginal wall into the bladder; silk ligatures about the pedicles of ovarian tumors, having set up an inflammation and consequent suppuration, have been known to find their way into the bladder cavity. Haggard found the full skeleton of an ectopic fetus that had ulcerated its way through the wall of the bladder. Dunn found a bone sequestrum nearly an inch long. These examples may be classed as accidental.

The most usual foreign body intentionally introduced into the urethra and thence entering the bladder is the hair pin used by masturbators. It is thought that under the influence of sexual excitement or orgasm, the foreign body, used in this way, escapes the grasp and is forced into the bladder. Women and young girls will use some foreign body, usually a soft rubber catheter, to bring about a miscarriage. In such cases, either through ignorance or accident, the catheter is sometimes forced into the bladder.

Usually the foreign body produces no symptoms for an hour or two, after which signs and symptoms of vesical irritation commence. There may be a pressing down feeling in the bladder, obstruction to the flow of urine, or a suprapubic pain. The urine soon becomes cloudy and later contains pus and blood.

The prognosis is favorable if the foreign body is removed early but, if allowed to remain in the bladder, severe septic inflammation with peritonitis is very apt to develop, and the prognosis becomes grave.

Determining the presence of a foreign body in the bladder should be comparatively easy from the history. A bimanual examination may suffice or a distention of the bladder with air, with the patient in the knee-chest position, may facilitate palpation of the foreign body.

The treatment calls for speedy removal of the foreign body either through the urethra, through an incision made in the bladder wall through the vagina, or through a suprapubic incision. The method employed depends upon the kind, size, and shape of the foreign body to be removed.

CASE REPORT

On June 25, 1933, a girl twenty years old, well developed, strong, and perfectly healthy, came to my office in a very excited frame of mind and said that she had "passed something up in herself and had lost it." She appeared impressed with shame, was very slow in answering questions, talked very little, and would not tell me just what had happened. I could not understand what the patient was trying to tell me, nor what had happened to her.

It very soon occurred to me that the girl, being pregnant, had used a rubber catheter to bring about a miscarriage, but examiantion did not reveal any foreign body in the vagina. Speculum examination showed the cervix normal and no sign of injury, so it was decided that the catheter was not in the uterus. The patient insisted that the catheter was "still in her," but where she would not say. After making a rectal examination and not finding it, and while I was talking with her she complained of a bearing down feeling in the bladder and a desire to urinate. This led me to think that the foreign body might be in the bladder. An x-ray was taken and the skiagraph clearly showed the catheter in the bladder.

The patient was taken to the Colonial Hospital at Rochester, Minnesota, and Dr. R. G. Scherer removed the rubber catheter through the urethra with an operative cystoscope and appropriate accessory instruments. She was allowed to leave the hospital that same night and made an uneventful recovery.

PRESIDENT'S LETTER

THE WOMAN'S AUXILIARY

FOR eleven years the Woman's Auxiliary of Minnesota has been doing splendid work along social, philanthropic and public health educational lines. I well recall in 1923 the president of the Ramsey County Auxiliary calling on me with reference to our first basic science bill. She expressed the willingness of the Auxiliary to help in any possible way. This same spirit has always been a characteristic of the Auxiliary all over the country. Their philanthropic activities cover a large field, governed chiefly by the needs of the various communities in which they live.

I can foresee in the future even greater effort in public health education among women and the promotion of an immunization program among children of school and pre-school age, against diphtheria and smallpox. Minnesota had twenty-six deaths from diphtheria in 1933. This is twenty-six too many. Children are coming into the world so fast that this campaign must continue indefinitely. Among our counties with the largest population, St. Louis County has the distinction of having had no diphtheria cases reported during 1933.

It is a startling fact that although tuberculosis has dropped from first to sixth place as a cause of death in Minnesota during the past thirty years, the incidence of tuberculosis among girls from sixteen to twenty-two years of age has shown no decrease. How much of this is due to dietary fads, insufficient clothing, too many cigarettes, and dances beginning at 10 P. M.? Who are better qualified to inaugurate a campaign of common sense among our high school girls than the members of the Woman's Auxiliary? How effectively this could be done in the smaller communities by the women giving an afternoon tea and asking a local doctor to talk to the girls!

When one considers the fact that cancer as a cause of death has jumped from sixth place in 1900 to second place in 1930, not only in Minnesota but in the country as a whole, one is forced to the conclusion that every available educational measure should be used. Contact with other women's clubs may be effected through the Woman's Auxiliary. The curability of cancer, provided it is recognized early, should be emphasized in these meetings. If desired, cancer films and speakers may be obtained through our secretary, Dr. E. A. Meyerding. I would like to see every branch of the Auxiliary sponsor a public cancer meeting in its own community.

President,
Minnesota State Medical Association.

EDITORIAL

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DR. ARNOLD SCHWYZER FETED

How much more gratifying it is to pay tribute to an outstanding medical confrère while he is present in the flesh, rather than to wait until he is gone. As it was so aptly put by one of the speakers at the dinner tendered Dr. Arnold Schwyzer by the Sisters of St. Joseph's Hospital on Lincoln's birthday last month, "an ounce of taffy is worth a pound of epitaphy."

Just forty-two years ago in February Dr. Arnold Schwyzer same to Saint Paul from Switzerland. His thorough training in the fundamentals of medical science gave him a broad foundation upon which to build through further study and experience. As a result of his industry and natural ability Dr. Schwyzer has become an outstanding figure in medical circles. His professional career has been closely linked with the growth and development of St. Joseph's Hospital, for he has worked continuously at this hospital since 1892, except for regular summer vacations, largely spent in study in his "sanctum sanctorum" on the shore of a small lake at his farm in northern Minnesota, and frequent trips to Europe.

Dr. Schwyzer has ever been generous in sharing the fruits of his study and wide experience with his fellow surgeons and especially with the younger men who, as interns or assistants, came in contact with him. This was freely attested at the banquet attended by some one hundred and fifty doctors, friends and members of the hospital staff. Addresses were made by Dr. C. C. Chatterton, chief of the hospital staff; Dr. Justus Ohage, Sr., veteran surgeon of Saint Paul; Dr. John L. Rothrock, Dr. William C. Carroll, Dr. Fred Schuldt and Dr. William J. Mayo, whose address (published in this issue of MINNESOTA MEDICINE) paid tribute to the guest of honor.

It is the wish of all of Dr. Schwyzer's many friends that he, hale and hearty at seventy, will continue his outstanding surgical work for many years to come.

BONE MARROW FUNCTION

Agranulocytic angina, primary and secondary, is frequently enough diagnosed to furnish diagnosticians with a stimulating urge to better evaluate the needs and importance of the bone marrow. It may be assumed that no clinical elucidation that has little application either enters the general consciousness of doctors or long supplies an urge to wider understanding. A treatment even generally promising provides still greater incentive. Pentnucleotide has its critics,[1] but to Schultz[2] and to Jackson[3] and his coworkers goes the credit of providing causative criteria and a treatment.

Recently unusual zest has developed because of the incrimination in etiology of "Benzene[4,5] chain derivatives . . . particularly those containing a barbiturate combined with amidopyrine." These types seem well established and with the polypharmaceutical flood drug houses are now providing rivaling the inundation featuring Noah, it is well to be on strict guard in interpreting

any doubtful throat accompanied by unusual prostration, anxiety, faucial pain and toxemia. A correct diagnosis can be easily made *before* the necrotic sloughs and contamination with vincent's organism appear.

It is in that stage, of course, that withdrawal of baneful drugs and venturing such bone marrow stimulants (pentnucleotide, transfusions, liver, x-ray) as we have may rehabilitate what appears to be one of the body's chief weapons of defense: the granular leukocytes.

Incidentally, we see in these agranulocytic types a depression of neither the red cells nor the platelets. Primary red cell anemia is extraordinarily rare; overlapping leukemias and thrombocytopoenic purpuras less rare; pure granulopenias are fairly common. Thus we see clinical proof of the genetic individuality of these three primary bone marrow blood elements so essential to life and its physiologic adaptations. When all three are depressed we have the clinical entity of "aplastic anemia." Its picture[6] is none too well defined and it is fortunately rare. It is only, however, by active interest in these rarities rather than passive therapeutic inertia that we shall come to appreciate the enormous potentialities in that treasure closet of the body—the bone marrow. E. L. T.

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CHICAGO'S AMEBIC DYSENTERY

Certain definite lessons can be derived from the epidemic of amebic dysentery which emanated from Chicago last summer and resulted in more than 700 known cases scattered in 206 cities throughout the United States.

The concentration of people in large hotels in our larger cities offers a splendid opportunity for the initiation of epidemics. Some of these "vertical towns" in our large cities are old structures, have a perfect maze of plumbing, and, as was the case in Chicago, no plans of the plumbing are available.

That any hotel could be built with cross connections between water supply and sewage seems unbelievable. That such was the case in Chicago and actually exists in other public buildings seems to have been determined. The problem is one for the sanitary engineer. The possibility of a back flow through drain pipes as a result of heavy rainfall or heavy demands on the drain facilities of a hotel is also in the province of the sanitary engineer.

We can see no excuse for the negligence on the part of the hotel management in not protecting the food supply of the hotel in question, following the inundation of the basement on two occasions last summer with drain contents resulting from heavy rainfall. This was gross carelessness and when such an unforseen accident occurs the hotel management is responsible for handling such a dangerous situation.

The Illinois Medical Society seems to feel that Dr. Bundesen, Chicago's Health Commissioner, was guilty of poor public health policy in not notifying the local medical profession of the existence of an unusual type of epidemic before he did. There is doubtless a widespread feeling of resentment on the part of members of the profession (to say nothing of certain individuals) throughout the United States, that the profession in general was not taken into the confidence of the Chicago Health Department long before it was. After all a health department makes a mistake in attempting to control an epidemic without frank publicity and invoking the aid of the medical profession.

TWIN CITY SEWAGE DISPOSAL PLANT

The local medical profession is distinctly interested in large industrial or engineering projects, involving as they do nowadays medical and surgical work. So it is with the construction of the proposed Twin City sewage disposal plant.

Involving the expenditure of eighteen million dollars to be loaned by the federal government through the Public Works Administration, the project is to be carried out by a Board of Trustees of the Minneapolis and Saint Paul Sanitation District. Contracts for various parts of the work are to be let to the lowest bidder.

For some reason or other the Board of Trustees made the proposal that the employers' liability insurance for all the contractors be let to one insurance company and that one surgeon be employed to handle all the medical cases involved, except for certain first aid requirements. What particular advantage to the workmen there is in such a suggestion we fail to see. Economy may have been the object. On the other hand such a

procedure is likely to result in the employment of a second rate surgeon, one who is willing to devote his entire time to a job of this sort, of limited duration, at the sacrifice of his private practice.

As the money being spent is furnished by the federal government, Uncle Sam has something to say as to how the money is spent. The employment of one surgeon has been disapproved by the state engineer who is in the employ of the federal government and has supervision of all PWA work in the state. It is to be hoped that his disapproval will be sustained by the federal authorities and that medical care in connection with this huge project will be handled in the usual way, the contractors handling their insurance separately and the medical work thus being distributed to the local members of the profession.

The question will naturally arise as to the right of the individual workman to choose his own doctor. While the workman has such right in this state, it has been the practice of insurance companies to direct injured workmen to specified surgeons, the idea implied or specifically expressed being that the employe cannot choose his own surgeon. We can see some justice in the insistence of the insurance companies on selecting certain surgeons to do their work. Certain members of the profession are not above "sticking it on" when an insurance company is paying the bill and certain doctors are not qualified for such work. If the insurance companies allow a certain amount of leeway in the choice of a surgeon, as they do, this is probably the best procedure to follow.

AN APPRECIATION OF DR. ARNOLD SCHWYZER*

WILLIAM J. MAYO, M.D.
Rochester, Minnesota

I am always glad to come to Saint Paul.

My father came to the state in 1854, and Saint Paul was the early center of his activities. In my younger days, through him I became acquainted with many members of the Saint Paul medical profession, with whom he was intimate. I learned to know and to admire these men. I knew Charles A. Wheaton, who I believe was one of the most brilliant surgeons that our country has produced, and one of his associates was Archibald MacLaren, of beloved memory, a man of sound surgical judgment in whom we all had confidence, and also Parks Richie, master, teacher, and for a time dean of the Medical School.

Minnesota has always had a splendid medical profession, and was one of the first states to pass medical laws, which, while they did not keep out the irregular practitioners and the outright quacks and mountebanks, did at least maintain a high standard for the members of the regular medical profession. We were fortunate also that there came into the state in the early days a number of men who had received their medical training in Europe, and who accompanied, so to speak, the great immigration to Minnesota from the Scandinavian and Teutonic countries. These countries had led in the scientific application of the new philosophies in medicine, and the physicians they gave to America brought with them not only a learning which we did not possess in comparable degree, but a willingness, nay, even a desire, to extend this new knowledge to other members of the medical profession.

Among others was Dr. Justus Ohage, an educated man from Germany, who came to Saint Paul in 1881, bringing knowledge of the newer developments in surgery. It is very interesting to know that Dr. Ohage was the first in this country to plan and carry out the operation of cholecystectomy, in St. Joseph's Hospital, Saint Paul, September 24, 1888.

Another great man was Dr. Eduard Boeckmann, born and educated in Norway, who came to Saint Paul in 1887. To Dr. Boeckmann we owe the first reliable steam sterilizer, and also a method of preparing pyoktanin-catgut for ligatures, which was the beginning of the absorbable suture in surgery. Dr. Boeckmann was the godfather of the splendid medical library of the Ramsey County Medical Society.

And there was Dr. Gottfried Stamm. Born in Switzerland, he came to Saint Paul in 1873, and lived there thirty-four years, until his death. He was a fine man and citizen, a most able and scientific physician and surgeon, free from professional jealousy. On one occasion he went out of his way to ask me, a very young man, to see a former patient in consultation, so that I should not be humiliated by a mistake which I had made in diagnosis.

Drs. Arnold and Gustave Schwyzer, born and educated in Switzerland, joined this illustrious group of profound scholars and teachers in 1891.

American surgeons, brilliant, and well trained though they were in anatomy through the Scottish masters and in the gross pathology of the "dead-house" of the English tradition, were not as yet so versed in the *pathology of the living* as these men who had been educated in Europe.

Pasteur, a Frenchman, did more for the human race than any other man who ever lived, but French surgeons, while they accomplished much in the middle of the last century for fine anatomical dissections, had not fully accepted the relationship to disease as brought out by Pasteur's discoveries just as the medical profession of Great Britain failed to grasp what Lister's discoveries meant to medicine and to surgery. It was in the Teutonic and Scandinavian countries in the middle of Europe that the contributions of Pasteur and Lister received great attention. The cities of Austria, of Germany, and of the Scandinavian countries were developing universities where the scientific knowledge which we had missed in our own development was brought forward. Virchow had developed his theory of cellular pathology, Koch and his fellow workers elucidated bacteriology in connection with tuberculosis and infections. Switzerland, a mighty country, yet of less than five million people, from the fourteenth century had maintained a liberal form of government and developed a unity of purpose in spite of the four languages, Swiss, German, French, and Italian, spoken within its borders by the people who composed the population, and was an example to the world in political integrity and scientific endeavor.

My brother and I, attending the clinics of Christian Fenger, in Chicago, who had received his scientific medical training in Denmark, there met Murphy, Ochsner, Senn and a host of others who also were thus gaining insight into the medical progress that had taken place in northern Europe.

In New York City at this time, Dr. Arpad Geza Charles Gerster, who was born in Hungary of Swiss

*Remarks at dinner in honor of Dr. Arnold Schwyzer, Monday evening, February 12, 1934, at St. Joseph's Hospital, Saint Paul, Minn.

parents, was conducting clinics of the same type as Fenger, engaged in the great task of teaching the new surgery to the American medical profession. Gerster, with his book, "The Rules of Aseptic and Antiseptic Surgery," published in 1888, did more to advance us in that knowledge which we lacked than any other man of his time.

As I look back on this period in American surgery, I recall brilliant men whose names are familiar to the older of you: in Boston, Maurice Richardson, Cheever, the Cabots, Warrens, Francis Watson, and many others; in New York, Robert Weir, Charles McBurney, William T. Bull. In Philadelphia was that great triumvirate, the Grosses, father and son, and David Hayes Agnew. And so one could go over the country, recounting great surgeons, trained anatomists, dead-house pathologists, but all at that time lacking in that essential thing which was brought in by Pasteur and Lister.

It was fortunate that my brother and I thus at an early time learned that the men who had received fine training in foreign countries and who were acting as our leaders in America had come from certain sections of Europe. In the middle nineties we, with numbers of other students of medicine, began going over to Europe each year to see and learn. We saw that what we had in America was the art of surgery based on the science of anatomy and dead-house pathology, but that we lacked the *living pathology* which was the foundation on which surgery must achieve its purpose.

On my second trip to Europe, in the late nineties, I went for the first time to see Kocher at Berne, Switzerland. Kocher was the great surgeon of his time. He inspired other men to advance the superstructure on the foundations which were being erected.

On my first visit, Kocher asked me where I was from. I told him Minnesota. He thought for a moment and said,

"Arnold and Gustave Schwyzer are living in Minnesota. Have you ever met them?"

I said that I had not and asked if they had been in Minnesota long.

"Yes, a few years. They are good men."

I remember thinking at the time that men who had had the opportunity of working as assistants in Kocher's clinic for a number of years certainly had a rich heritage to bring into a country which needed highly trained men as much as we did.

You may rest assured that when I came home I made a business of meeting the Schwyzers. There grew up between them and my brother and myself, friendship. We did not meet often, but we found them helpful, modest, aiding by example even more than by precept. I can remember many friendly things that Arnold Schwyzer has done for me that have aided in clearing confused thought, especially in foreign literature with which I was not so familiar. I did not get my German until high school and college; I should have had it when I was a child, as the Swiss do. I could read French, but slowly. Consequently when I was in Europe, I always felt and acted and spoke like a foreigner. Languages should be taught to our students when they are young.

In those early days I was very much interested, as I always have been, in carcinoma of the stomach, and in the nineties I did some planned resections, for carcinoma of the stomach, following the Billroth II method. There was very little known about the lymphatics at that time, however, and from the dead-house and anatomical studies and what I could learn from the literature, I had written a paper, of which I was proud, on the lymphatic supply of the stomach in relation to cancer. Arnold Schwyzer made us one of his visits at about that time and I remember so well showing him my paper. He read it and paid me some kind compliments. I asked him if he knew of anything that had been written on the subject, for I had been unable to find anything of particular value. He said that a short time previously a young Frenchman had presented a thesis on this very subject before the University of Paris, and he was kind enough to send me a copy. I found that this young man had done the work I had done but very much more work and very much better. It was most illuminating and helpful.

I speak of this incident because of the friendly way in which Dr. Schwyzer helped me, and because it illustrated two things: Dr. Schwyzer's desire to aid one who was making an attempt to progress in surgery, and second, the kindliness with which he accomplished his purpose. Dr. Schwyzer's friendly relationships, his desire to encourage progress, not only of the profession as a whole but of individuals in the profession, have established for him a leadership in surgery in the state.

It would be idle for me to speak to you who know him so well of the many contributions he has made to surgery, and by example illustrating the difference between the surgeon and the operator. Surgery is more a matter of mental grasp than it is of handicraftsmanship. I think all of us who have worked years in the profession understand that many very skillful operators are not good surgeons.

Dr. Schwyzer has always approached his surgical discussions from the standpoint of the science of surgery as well as the art, revealing that early fundamental training which stimulated his thought along the lines of the causes and development of disease conditions, to advance along sound lines of prevention and cure. As Professor of Clinical Surgery at the University of Minnesota, Dr. Schwyzer encouraged the students to think, not merely to remember, and all those who attended his clinics were profoundly influenced in their future careers.

The merit of the quiet, modest man whom we honor tonight has been recognized by the profession to a greater extent than he perhaps has realized. I think Dr. Schwyzer, when his name came up before the American Surgical Association, was surprised, and I hope pleased, to know that he was one of the few men to have the honor and distinction of being taken into the Association by unanimous vote on the first ballot.

It was with great pleasure that I accepted the invitation to meet with you tonight to pay tribute to Dr. Schwyzer, to tell him how much he has aided the profession in Minnesota in developing their surgical understanding, to thank him for his kindly and friendly coöperation with his colleagues and for the sympathetic manner in which he has protected us in our mistakes and prevented us from being subjected to criticism.

In joining with you in honoring our colleague on this occassion, I have taken advantage of the opportunity to express the appreciation that American surgeons feel for the aid given by the highly educated, wise men, among whom none is more esteemed than Arnold Schwyzer, who came into this country in the eighties and nineties and enabled us to gain a new viewpoint of surgical science. I am personally grateful to Dr. Schwyzer for the help I have received so generously and so whole-heartedly.

ANTUITRIN S

"Antuitrin S"—Parke, Davis & Co., is said to contain the "prolan" principle of Aschheim and Zondek, obtained from the urine of pregnant women. The published evidence indicates that prolan is of value only in certain cases of functional uterine hemorrhage. THE JOURNAL does not know of any evidence that it may relieve hemorrhage due to uterine tumors of any sort, whether benign or malignant. Antuitrin does not stand accepted by the Council on Pharmacy and Chemistry. (Jour. A. M. A., November 4, 1933, p. 1503.)

OF GENERAL INTEREST

Dr. Walter P. Gardner has announced the opening of his new office for the practice of neurology and psychiatry at 1054 Lowry Medical Arts Building, Saint Paul, Minn.

Requests for physicians have been received from two cities in Minnesota. Anyone who is interested will please communicate with the Minnesota State Medical Association, 11 W. Summit Ave., Saint Paul.

Dr. Arnold Jackson of Madison, Wisconsin, is making a survey of the incidence of cretinism in the United States and requests physicians who have records of such cases to furnish him with the essential data of the case including name (to avoid duplication), address, nativity, age, sex, physical characteristics (in brief), clinical history (in brief), presence or absence of goiter, mental status, results of medication. Photographs are especially desired. No one has as yet made such a survey and the data will be turned over to the American Medical Association for reference and study.

An additional $500,000 has been given the University of Minnesota for use in connection with the activities of The Mayo Foundation by the Mayo brothers. In a letter from Dr. William Mayo to the Board of Regents of the University received February 16, 1934, Dr. Mayo outlined his idea of devoting some of the funds received by The Mayo Clinic from the sick to the establishment of a permanent Foundation for medical education and research to the ultimate benefit of the sick. In 1915 a million and a half dollar endowment, under the title of The Mayo Foundation, was given the University with the stipulation that the fund should be allowed to accumulate to two million before it should be used. The temporary arrangement was made permanent in 1917.

In 1919 the Mayo Properties Association, a charitable corporation without capital stock, holding title to all the lands, buildings, laboratories and equipment of all kinds used in Rochester in the work of the Foundation, was created. This association has had the same purpose as the Foundation and this additional gift constitutes a transfer of $500,000 from the Mayo Properties Association to add to the endowment of The Mayo Foundation. The gift has been gratefully accepted by the University.

OBITUARY

Dr. Cyrus Bowers Eby
1872-1934

Cyrus Bowers Eby was born December 9, 1872, at Sebringville, Ontario, where his father was a practising physician. His early education was obtained in the Sebringville schools and at the Collegiate Institute at Stratford, Ontario. In 1889 he and his brother Robert entered the University of Minnesota, where he braduated in Medicine, with honors, in 1892.

After graduating, Doctor Eby obtained a position as physician at the Rochester, Minnesota, State Hospital, later becoming Assistant Superintendent at this institution. After leaving the Rochester State Hospital he spent about a year in practice in the mining town of Mountain Iron, Minnesota.

While living in Rochester he was married to Miss Blanche Bamber, of that city, in July, 1896.

After leaving Mountain Iron in 1903, Doctor Eby located at Spring Valley, Minnesota, where he continued to live and work until the time of his death.

The story of Doctor Eby's life reminds one of the famous stories of country doctors in fiction and film. Plain and unassuming, he was devoted to his work, his home and his simple recreations, which he had chiefly in fishing and outdoor life, and in his beloved garden. His greatest hobby, however, was his work, and he is chiefly remembered because of his devotion to needy people and for his love of children.

His funeral day was like a sabbath day, as the business places were all closed in his honor. Crowds of people from every walk of life filled and overflowed the large Methodist church where the funeral services were held.

The stories one heard about him were all the same: that he was looked upon as a friend, and that many people consulted him about business and personal matters as well as for illness. Many people said, "His place cannot be filled."

Even the end came in the simple, heroic way that was in keeping with his life, through devotion to his work. Although he was not well he answered a call some ten miles in the country. The road was blocked with snow, and he had to shovel and apply chains to get through. A chain was lost and he tried to fasten a rope about the wheel. After a great deal of exertion he reached his destination. Sitting beside his patient's bed he remarked that he had a little heart trouble and then fell forward, in death.

Words cannot add to the nobility of Doctor Eby's life and its passing. Most doctors would envy the way of his life and its ending.

Surviving Doctor Eby are his wife Blanch, and his son Robert, and his daughter Esther, two brothers, Doctor Robert Eby of Elko, Nevada, and Frederick of Austin, Texas, and two sisters, Dorothy and Grace of Trenton, New York.

Doctor Eby was a member of the Olmsted-Houston-Fillmore-Dodge County Medical Society, Houston-Fillmore Medical Club, the Southern Minnesota Medical Association, the Minnesota State Medical Society and the American Medical Association.

J. E. Crewe, M.D.

Dr. Fred N. Hunt
1857-1934

Dr. Fred N. Hunt, for fifty years engaged in the practice of medicine in Fairmont and Blue Earth, passed away at his home in Fairmont on January 31, 1934.

Fred N. Hunt was born on September 30, 1857, in Sterling County, Illinois. He was the son of Reverend Nehemiah Hunt, a circuit riding minister whose abolitionist activities resulted in his being driven from his home community. The Hunt family moved to Lura Township, Blue Earth County, in 1864.

After three years at Carleton College, Dr. Hunt returned to Fairmont in 1879 as teacher in the higher department of the village school.

In 1882 Dr. Hunt was married to Miss Ida Cadwell, the ceremony being performed by the bridegroom's father.

Graduating in 1883 from the Missouri Medical College, Dr. Hunt began practice the same year in Fairmont. In 1892 he moved to Blue Earth, where he practiced for twenty-one years, returning to Fairmont in 1914. In partnership with his son, Dr. Roscoe Hunt, he established the first hospital in Fairmont.

Always interested in the town of Fairmont, Dr. Hunt contributed largely to its development and was ever a leader in community activities. His friends knew him

as a cultured and most companionable gentleman, as well as a successful physician.

In spite of his years, Dr. Hunt was active in practice until about two weeks before his death, when he fell on the step of his home, sustaining injuries from which he did not recover. Mrs. Hunt and two sons, Dr. Roscoe Hunt of Fairmont and Rollo Hunt, an attorney residing in Duluth, survive.

A WOMAN PIONEER IN A NEW PROFESSION, MEDICAL EDITING

With the passing of the editor of the publications of The Mayo Clinic it is fitting that some record here be made of the events of her life relating to her professional career. Genius is inexplainable but contributing factors are worthy of study. Childhood on a pioneer farm, meager country and village schooling, and a two-year nurses' training course at best are only negative in their implication of the literary ability developed by this great editor. What then were the traits of character which, shaped by her personal contacts, made her what she was?

Annie Maud Headline was born near Faribault, Minnesota, of unusually intelligent Swedish parents. She was the youngest of seven children. Her father, whom she closely resembled physically and mentally, was noted for his fine mind and strong character. Her mother was of a happy disposition, an unresting worker, and meticulously orderly in all her ways.

Annie's early schooling was obtained in brief terms in one-room country schools situated respectively one and three and a half miles away, and in two terms in a small village "Academy." Of her personal reading there remain records of her having read Charles Kingsley's "Greek Heroes," many of Scott's, Dickens', Thackeray's, Poe's and W. D. Howell's novels, Oliver Wendell Holmes' "Autocrat" series, and Shakespeare, before she was eighteen years of age.

As the girl grew up her aspirations did not turn to teaching, the occupation of both her sisters, but toward medicine. Without sufficient money to support herself in medical school, on the advice of her sister's physician, in 1885 she entered the training school for nurses of the Presbyterian Hospital in Chicago "because the hospital opened into Rush Medical College."

As a student nurse Miss Headline was the leader of her class. In addition she attended all lectures she possibly could find time for in Rush Medical College. Her text-books, still preserved, include in addition to those used in the nurses' course, the standard works on anatomy, physiology, and chemistry then recommended for the use of students in Rush Medical College. She was a star student in anatomy under the tutelage of Charles T. Parks. Though she was never permitted to dissect, her texts include a good colored atlas of anatomy. She was not officially enrolled as a medical student but Moses Gunn, Norman Bridge, Charles T. Parks, Walter S. Haines, J. H. Etheridge and other members of the faculty of Rush Medical College and teachers in the Nurses' Training School aided and abetted her in her unofficial study of medicine. The middle eighties was a golden age in the faculty at Rush. The friendships and inspirations of the men mentioned were marked factors in the development of Miss Headline's keen mind. Perhaps most influential of these was that master teacher, Moses Gunn, whose personal inspiration was so great a factor in the lives of such men as Charles T. Parks, J. B. Murphy, A. J. Ochsner and other surgeons. It was equally a factor in the professional life of Annie Maud Headline, who was his favorite nurse for more than two years and who nursed him through his last illness.

After graduating in nursing May 10, 1887, Miss Headline did private nursing in and out of the Presbyterian Hospital until September of the same year, when she became "matron" (superintendent) of the Maurice Porter Memorial Hospital for Children in Chicago. While this gave her a better income it interfered with her further study of medicine. This study was finally definitely terminated when on September 28, 1889, she married Dr. Ernest J. Mellish.

Dr. Mellish's diary, covering the period from 1879 to 1897, records his graduation from Rush in 1886 and three years' hospital training, the first two of which were in the Presbyterian Hospital and the last in Cook County Hospital. He was a young surgeon of great promise but tuberculosis, which had manifested itself before his marriage, drove him out of Chicago to Ishpeming, Michigan, where he remained three years, returning to Chicago in December, 1892. Here on May 10, 1893, at her husband's request Mrs. Mellish dropped the name "Annie" and became "Maud" to her later friends.

In the depression in the years immediately following the World's Fair the young couple had a desperate struggle for a livelihood and for Dr. Mellish's life, though he was doing much work in charity hospitals and devoting much time as an instructor in Rush Medical College. He took an active part in medical societies and, encouraged by his wife, wrote a considerable number of medical articles. In March, 1896, his diary says, "Maud is of inestimable aid to me in revising my papers. I am sure they are much more readable for the revision. There are no superfluous words left in them."

During a partial quiescence of his disease from 1897 to 1901 Dr. Mellish's surgical practice grew to be quite successful. A recurrence of his symptoms in 1901 forced him, accompanied by his wife, to migrate to El Paso, Texas, where for a time he partially recovered and built up a considerable surgical practice. He died in El Paso April 23, 1905.

There is no doubt that during the sixteen years of her early married life Mrs. Mellish, despite worry over sickness and financial stringency, much occupied herself with reading and criticizing medical literature in connection with the work of her husband and that of Dr. A. J. Ochsner. After her husband's death, when she was forty-three years of age, she realized that she could more readily make headway in a field related to medicine, but not requiring the further formal professional schooling which would be necessary for medical practice. She spent the next two years in Chicago arranging a library for Augustana Hospital, many of the books in which she had loaned to the institution. In the same time she was doing editorial work for Dr. A. J. Ochsner. Her chief editorial work during this period was on the large volume on "Hospital Construction" by Dr. Ochsner and Architect Sturm.

In the meantime in the organization which was to become The Mayo Clinic the increase in the number and length of services of interns and residents had rendered very pressing the need of a library other than the private libraries of the members of the staff. Dr. William J. Mayo appealed to his friend Dr. Ochsner to suggest someone to develop a library. Dr. Ochsner recommended Mrs. Mellish. On March 1, 1907, she was taken on the staff "to organize and develop a library and to do editorial work in connection with the publication of papers."

The library at that time consisted of the books in three small cases and the journals on a small reading table. It rapidly grew, however, until in 1909 a small library building, which was joined to the offices by a corridor, was erected to house it. Within three years this building was outgrown. Consideration of enlarging it in 1912 led finally to the decision to provide ample room for a library in a general clinic building. In 1914 the Division of Publications was organized with an

editorial section, a library section, and an art studio. Mrs. Mellish was made director of the Division and head of the editorial section. A trained librarian was placed in charge of the library and Mrs. Mellish thereafter devoted most of her time to editorial work.

In 1924 Mrs. Mellish married Dr. Louis B. Wilson, head of the Division of Laboratories of The Mayo Clinic and Director of The Mayo Foundation. The two had been intimately associated since 1907 through the many contacts of their respective departments and in planning the library arrangements in both new buildings.

The volume of work accomplished by Mrs. Wilson with the aid of always loyal though always too few assistants was stupendous. Any numerical expression of the volume of this work is inadequate, for such expression gives no picture of those aspects of the task which were not in evidence but which took much time and energy. Nevertheless, in the "Collected Papers," under the various titles which the volumes bore from 1905 to 1933, inclusive, are recorded nearly 6,000 papers. From 1921 to 1933, eleven volumes of the Surgical Clinics of North America and twelve volumes of the Medical Clinics of North America were contributed by The Mayo Clinic. Two volumes of the early papers of Drs. W. J. Mayo and C. H. Mayo passed under the scrutiny of Mrs. Wilson, eight Mayo Clinic Monographs, four volumes of Mayo Foundation Lectures, one volume of Beaumont Foundation Lectures, two volumes of The Physicians of The Mayo Clinic and The Mayo Foundation, two volumes of papers from The Mayo Foundation and the Medical School of the University of Minnesota, the annual Transactions of the Association of Resident and Ex-Resident Physicians of The Mayo Clinic and The Mayo Foundation from 1919 to 1932, and five other books, two of which are large works. In 1926 began one of the most arduous activities of the Division of Publications, namely, weekly publication of the Proceedings of the Staff Meetings of The Mayo Clinic. Organizing this activity and subsequent editing of the material and supervision of the publication and distribution fell to the lot of Mrs. Wilson.

Scarcely any article or book during this entire period was published without a detailed criticism and editing by the chief editor, a task to which she sacrificed all other interests. Many of the articles coming to the editorial department had to be recast by the editor in consultation with the author. In all her work she always strove to preserve not only the facts but the author's individuality as well.

Most medical editors of fifteen years ago were doing editorial work incidental to their principal occupation in some form of medical practice. Their chief concern was in the general content of their journals. Mrs. Wilson's chief concern was in procuring the most correct and most understandable statement of the subject matter of each article. Hers was penetrating, scientific, literary criticism at a stage when it assisted rather than chagrined the author. Yet when she edited a book or a volume of "Collected Papers" she made of it a balanced unit, sometimes as much by elimination of irrelevant matter as by logical arrangement of that included. This is why "Collected Papers" has never been merely an accumulation of reprints but a coördinated annual report of the work of the institution from which it emanated.

It was through her individual relationship with the members of the professional staff of The Mayo Clinic and with the Fellows of the Mayo Foundation that this great woman most exercised her moulding influence on the intellectual life of the two institutions. Her clear thinking, her unbiased judgments, and her insistence on the truth and nothing but the truth, stated so that readers could understand it, made her influence on the physicians with whom she worked prodigious and inescapable. Though a woman of strong emotions she utterly divorced these from her professional work. The interests of the individual author were always secondary to those of the institution. Always her first question was, "Is it true?" second, "Are its relations to other work in the Clinic and elsewhere fairly defined?" and third, "Is it worth publishing?" These questions settled, she proceeded to make the article clearer. Her intuition of scientific error was phenomenal despite the meagerness of her formal training in medical science. Her insistence on herself thoroughly understanding each article passing through her hands soon gave her a breadth and accuracy of medical knowledge not possessed by all physicians. Her adherence to what her judgment dictated regardless of consequences came from her utter fearlessness. Her skill in English came to some extent from much reading of good literature but to a much greater extent from her critical attitude toward every written phase. While an untiring student of reference books on English language and composition, her mind frequently leaped far ahead of these and accepted or rejected words, phrases, and constructions long before her judgments were backed up by broader usage.

As so frequently happens with great literary critics she did little original writing herself. A few papers, one small monograph on "The Writing of Medical Papers" (1922), now in its third edition, and joint authorship with Dr. Wilson of a brief "Historical Sketch of The Mayo Clinic and Mayo Foundation" (1926) constituted her original publications. Yet for a quarter of a century she made effective the medical thought of the men of The Mayo Clinic and The Mayo Foundation.

When an exploratory operation in October, 1932, disclosed widespread abdominal carcinomatosis she did not falter but, in the intervals between courses of roentgen treatments, kept actively engaged in editorial work in her office until six weeks before the end.

Thus we may perceive some of the factors of this pioneer's determination, self-sacrifice, and genius which enabled her to surmount seemingly impossible barriers and to become, as many competent judges have said, not only one of the greatest medical editors of her time, but also the most powerful influence in clarifying, coördinating, and orienting the scientific thought of more than a thousand men and women who have placed on paper the results of their professional work while connected with The Mayo Clinic and The Mayo Foundation during the last three decades. The record of her labors is graven on every page of their published work; her inspiration to truthfulness and fairness to others on every mind.

December 15, 1933.

LOUIS B. WILSON.

(From the Supplement to *Proceedings of the Staff Meetings of The Mayo Clinic,* December 20, 1933.)

AMPULES SODIUM CACODYLATE 7½ GRAINS (0.5 GM.), 5 C.C. (FOR INTRAVENOUS USE) AND AMPULES SODIUM CACODYLATE 15½ GRAINS (1.0 GM.), 10 C.C. FOR INTRAVENOUS USE (CHEPLIN BIOLOGICAL LABORATORIES) NOT ACCEPTABLE FOR N.N.R.

The Council on Pharmacy and Chemistry reports that the Cheplin Biological Laboratories presented these ampules of sodium cacodylate (among others) for consideration as to inclusion in New and Non-official Remedies. The Council holds that the desired effects of sodium cacodylate may be achieved by oral administration of the drug or, in exceptional cases, that the intramuscular route may be desirable. The Council therefore held these ampules of sodium cacodylate unacceptable for inclusion in New and Non-official Remedies. (*Jour. A. M. A.,* December 23, 1933, p. 2050.)

A FORUM OF THE COMMITTEE ON PUBLIC HEALTH EDUCATION

MEDICAL CARE DIMINISHES FOR CWA

Hospital Association Hires Lobby: Veterans "Unable to Pay"

When the CWA and the CWS were first set in motion, the government appeared to have undertaken to furnish certain types of medical care to millions of men and women.

Medical bodies hastened to confer with the authorities in charge. As a result, arrangements were early affected in most communities whereby CWA employees were to be taken care of by civilian physicians in civilian hospitals without the necessity for further elaboration of government medical services.

The probable scope of this medical care to CWA workers was overestimated, however, and many difficulties foreseen at the start have not materialized and will not materialize according to news brought back from Washington by C. B. Wright of Minneapolis, Trustee of the American Medical Association, and member of the Legislative Committee of the organization.

Says Dr. Wright: "The Government is not planning to provide medical care on a large scale for the temporary employees of its Civil Works Administration.

"This employment is being dropped as rapidly as possible. Millions are already off the rolls. Medical care for these people has amounted to very little more than first aid for minor injuries suffered in the course of their work. A comparatively small amount of the appropriation has been spent under the agreements reached between local administrators and local medical groups. The amount will grow steadily smaller.

"All proposals to give these employees physical examinations have been opposed by Washington from the start on sound grounds.

"To examine this army of men and women adequately would involve the government in a huge and wholly unjustified expenditure. To examine them cheaply and hastily would be worse than useless so far as protection goes for the government or for the worker.

"At the same time, claims for compensation on the part of the employees would be encouraged and facilitated. A physical examination which might easily pass over such grave chronic conditions as tuberculosis would then be on record.

"The government is strongly opposed to setting up any elaborate machinery for the care of these employees since it is hoped that their employment will terminate in May."

Among other matters of interest brought home from Washington is the news that the American Hospital Association now supports a lobby in Washington. This association has been very active in the politics that concern management and administration of hospitals in the last few years, such, for instance, as the recent tariff that affects the price of soap, a commodity of importance to hospitals.

* * *

The American Legion's "Four Point Program" for veterans of the World War, which was adopted last summer on the heels of the Economy Act of March 20, 1933, embraces an urgent plea for restoration of hospitalization for veterans to its former status.

Executive orders have gradually liberalized the restrictions of the act to a point where, with the Executive Order of January 19, 1933, and interpretations under which Regional Offices of the Veterans' Administration have been operating since early February, all beds in the hospitals have been occupied again and few obstacles are placed in the way of any sick veteran of ninety days' service who applies for care. The Legion hopes to erase most of the remaining obstacles.

Point two of the "Four Point Legion Program" embodied in the bill introduced by Senator Reed of Pennsylvania (who was violently opposed in the last Congress to the care of the non-service-connected disabilities) would make it obligatory on the part of the Veterans' Administration to hospitalize any man with a non-service-connected disability on the mere statement that he need hospitalization and was unable to pay for it. This would open up the hospitalization program on a greater scale than it was under "202-10," which provided that the Veterans' Administration might hospitalize needy veterans with non-service-connected disabilities if beds were available.

There is no question but that the last executive order made adequate provision for the care of the needy veterans with non-service-connected disabilities. It leaves with the Veterans' Administration the determination of the point as to whether the man really needs it or not, and the interpretation of the Veterans' Administration is that any single veteran who earns $50 a month is not eligible for care of non-service-connected disabilities.

The hospitals are now instructed, according to their facilities, to care first for total and permanent war service disabilities; next for war service disabilities of less extensive character; next for chronic conditions such as tuberculosis; then for emergencies not connected with service; and finally, for all men injured in the line of duty for all their illnesses whether or not they are related to service. The Veterans' Administration is empowered to contract again for facilities for its patients in other government hospitals and, ultimately, if necessary, in civilian hospitals.

From W. J. Mayo on "The Value of the Medical Society to the Practitioner of Medicine" printed in the Proceedings of the Staff Meetings of the Mayo Clinic, January 17:

"I have never understood why so many men do not belong to their county and state medical societies. I have questioned such men sometimes. They usually say they do not find the societies of much value. But they do not help to make them valuable. They say they can get the same information from books and journals. But the individuals who seek isolation soon find that it is not necessary for them to take good journals and books. They begin to rely on cheap medical journals which advertise certain remedies which, it is hoped, will take the place of medical consultations. After a time, you will find that the dust gathers even on these journals unopened."

REPORTS AND ANNOUNCEMENTS OF SOCIETIES

MEDICAL BROADCAST FOR THE MONTH

The Minnesota State Medical Association Morning Health Service.

The Minnesota State Medical Association broadcasts weekly at 10:15 o'clock every Wednesday morning over Station WCCO, Minneapolis and Saint Paul (810 kilocycles or 370.2 meters).

Speaker: William A. O'Brien, M. D., Associate Professor of Pathology and Preventive Medicine, Medical School, University of Minnesota.

The program for the month of March will be as follows:

March 7—Heart Adaptations.
March 14—Scarlet Fever.
March 21—Anemia and Its Treatment.
March 28—Cancer of the Cervix.

ANNUAL MEETING

Several distinguished out-of-state speakers have already accepted invitations to appear before the 81st annual meeting of the Minnesota State Medical Association to be held in Duluth, July 16, 17 and 18.

Among them are Walter Bierring, Des Moines, president of the American Medical Association; A. B. Moore, Washington, D. C., and J. C. Towey, Powers, Michigan. Others who are expected to appear are John Fulton, Yale University; Max Cutler, Chicago, and P. T. Bohan, University of Kansas.

Program plans were practically completed at the February 15 meeting of the Committee on Scientific Assembly which met at the Lowry Hotel in Saint Paul. They call for special society meetings, similar to the successful series held on the first day of the Rochester meeting last year, on Monday. Tuesday and Wednesday mornings are to be devoted to dry clinics with a symposium on "Recent Acquisition in Endocrinology" featuring Tuesday afternoon's program. One hour of program time each day will be given over to demonstrations for small groups and to exhibits.

AMERICAN CONGRESS OF PHYSICAL THERAPY

MIDWESTERN SECTION

The Mid-Western Section of the American Congress of Physical Therapy will hold its spring session on Tuesday, March 13, 1934, at Indianapolis, Indiana. The morning will be devoted to clinics at the University and Indianapolis City Hospitals. The afternoon scientific session, commencing at one o'clock, will be held at the Indiana University School of Medicine. The evening session at eight o'clock will be held jointly with the Indianapolis Medical Society, at the Athenaeum.

MINNESOTA STATE MEDICAL—UNIVERSITY CLINIC

On Monday, March 26, 1934, and Tuesday, March 27, 1934, clinics will be given at the University of Minnesota Hospitals from 8 A. M. until 9 P. M., except for a fifteen minute recess mornings and afternoons and an hour for lunch and dinner. The clinics will each be of a half hour's duration and will be given by members of the Clinical Staff of the Medical School of the University of Minnesota.

Seventeen clinics on the diagnosis and treatment of cancer and seventeen clinics on practical subjects in medicine, neurology, dermatology, surgery, urology, orthopedics, obstetrics, gynecology, ophthalmology, otolaryngology, diagnostic x-ray and preventive medicine. The clinics in malignancy will include the bladder, prostate, bone, breast, bronchi, lung, esophagus, eye, lymph node, lip and oral cavity, ovary, pharynx, larynx, rectum, skin, stomach and uterus. In addition, special demonstrations will be made of the use of x-ray and radium. All of the clinics will be practical and patients will be shown.

Registration details to be announced later.

KANDIYOHI-SWIFT-MEEKER SOCIETY

A fracture course has been organized by the Kandiyohi-Swift-Meeker County Medical Society consisting of six Thursday evening dinner meetings to be held at the Lakeland Hotel at Willmar. Six Minneapolis surgeons have been requested to present the course. The dates, subjects and speakers are as follows:

February 8: "Head Injuries, Fractures of the Facial Bones and of the Cervical Spine"—Dr. Arthur A. Zierold.

February 15: "Fractures of the Clavicle, Scapula, Ribs, Sternum and Dorsal Spine"—Dr. Robert F. McGandy.

February 22: "Fractures of the Upper Extremity"—Dr. Richard R. Cranmer.

March 8: "Fractures of the Pelvis, Sacrum, Coccyx and Lumbar Spine"—Dr. Edward A. Regnier.

March 15: "Fractures of the Femur and Patella"—Dr. Roscoe C. Webb.

March 22: "Fractures of the Tibia, Fibula, Ankle and Foot Bones"—Dr. Willard D. White.

TODD COUNTY SOCIETY

Todd County Medical Society was organized in November, 1933. At the first meeting the following officers were elected: President, W. W. Will, Bertha; secretary and treasurer, B. L. Gifford, Hewitt. Charter members were: J. M. Cook, Staples; W. J. Lund, Staples; Chas. Reichelderfer, Staples; F. N. Grose, Clarissa; M. E. Mosby, Browerville; J. T. Laughlin, Grey Eagle; E. J. Simons, Swanville; B. F. Van Valkenberg, Long Prairie; F. W. Van Valkenberg, Long Prairie; G. R. Christie, Long Prairie; R. L. Christie, Long Prairie.

Meetings are held every six weeks with a dinner for all. The doctors' wives are always invited and play bridge during our meetings. Three meetings have been held this fall with the doctors of Bertha, Staples, and Long Prairie as hosts.

Attendance at all meetings has been practically one hundred per cent. Guest speakers have been A. W. Ide, M.D., Saint Paul; L. F. Hawkinson, M.D., Brainerd, and W. F. Wenner, M.D., Saint Cloud.

The next meeting will be held at Browerville, April 5, 1934. All physicians and their wives in the neighborhood of Todd County are cordially invited to attend.

B. L. Gifford, *Secretary.*

UPPER MISSISSIPPI SOCIETY

Officers elected at the recent meeting of the Upper Mississippi Medical Society held in Brainerd, Minnesota, are as follows: President, Dr. R. A. Beise, Brainerd; first vice president, Dr. C. Z. Kerlan, Aitkin; second vice president, Dr. A. M. Watson, Royalton; third vice president, Dr. Tom Davis, Wadena; secretary-treasurer, Dr. G. I. Badeaux, Brainerd.

Delegates to the State Medical Society convention are Dr. J. A. Thabes, Sr., Brainerd, and Dr. Tom Davis, Wadena; alternates, Dr. B. W. Kelly, Aitkin, and Dr. Hendrickson, Wadena.

PROCEEDINGS OF THE MINNESOTA ACADEMY OF MEDICINE

Meeting of January 10, 1934

The regular monthly meeting of the Minnesota Academy of Medicine was held at the Town and Country Club on Wednesday evening, January 10, 1934. Dinner was served at 7 o'clock. The meeting was called to order at 8 o'clock by the president, Dr. A. E. Wilcox.

There were fifty-eight members and seven guests present. This was the annual meeting of the Academy and members had been notified that they might bring as their guests their sons who are either practicing or studying medicine, or medical students in whom they are interested.

Dr. J. L. Rothrock, a past president of the Academy, was elected to Honorary Membership.

THE RISE OF CLINICAL THERMOMETRY IN THE UNITED STATES

Dr. C. D. Freeman, the retiring president, read his presidential address on the above subject. (To be published in full.)

The meeting adjourned.

R. T. LaVake, M.D.
Secretary.

WOMAN'S AUXILIARY

President—Mrs. A. A. Passer, Olivia
Chairman Press and Publicity—Mrs. Glen R. Matchan, Minneapolis
Editor—Mrs. S. H. Baxter, Minneapolis

STATE MEETING

Speakers for the annual meeting of the State Auxiliary at Duluth, July 16, 17 and 18, 1934, include Dr. W. Bierring, Des Moines; Dr. Arthur J. Cramp, Chicago, and local doctors. Dr. Cramp is director of the Bureau of Investigation and will give a cosmetic talk under the title "Mrs. Gullible's Travels in Cosmetic Land." Dr. Bierring is president of the American Medical Association.

BLUE EARTH AUXILIARY

A meeting of the Blue Earth Auxiliary was held January 29, 1934, at the home of Mrs. R. G. Hassett. Dr. A. E. Sohmer gave a talk on "Cancer Education."

The following members were elected to office for the ensuing year: Mrs. R. G. Hassett, president; Mrs. M. I. Howard, vice president; Mrs. A. W. Eckstein, recording secretary; Mrs. A. J. Wentworth, corresponding secretary; Mrs. I. V. Miller, treasurer.

This Auxiliary has a 100 per cent organization and meets monthly. The members have been sewing for local destitute families.

ST. LOUIS AUXILIARY

Meetings of the St. Louis Auxiliary are held each month and the activities include a horoscope tea; German party; dessert bridge; annual dinner dance; scholarships for nurses; Christmas baskets for the rural districts of the county; entertainment of the Woman's Auxiliary at the State Convention next July. First prize in the Radio Contest sponsored by the Public Health Association was won by Irving Copolowich of Duluth. The plaque donated by the State Auxiliary was presented to Mr. Copolowich by Mrs. Anthony Bianco, president of St. Louis County Auxiliary, at a ceremony held at the High School, January 28, 1934.

HENNEPIN COUNTY AUXILIARY

The Women's Auxiliary of the Hennepin County Medical Society has begun this year of 1934 with much activity, and the members are responding with such a fine spirit of enthusiasm and coöperation that we feel assured that every committee is well repaid for its efforts.

On Friday afternoon, January 5, about sixty members of the Auxiliary met in the club rooms of the Hennepin County Medical Society for a bridge and bunco party. During the afternoon Mrs. W. W. Moir lead the group in singing a very fetching ditty to the accompaniment of a series of gay posters hung on the wall.

A joint meeting of the Auxiliary and the Medical Society featured the evening of February 5, when about 350 gathered for an evening of jollity and good fellowship in the club rooms. The committee in charge of general arrangements consisted of Mmes. Harold S. Wahlquist, C. A. Boreen, J. M. Lajoie, R. F. Erickson, W. W. Moir, Harvey Nelson, and R. R. Noice. No effort had been spared to make every minute festive with the valentine spirit from the time we entered the door of the assembly room, which had been converted into a bower of hearts and balloons, until we partook of a bountiful Duch lunch. The program was one of unusual merit rendered by members of the two groups. It was a revelation to all of us that we have within our membership such operatic, symphonic, and dramatic stars.

"The Low Brow Orchestra" which furnished music throughout the evening consisted of Drs. Percy Ward, S. H. Schaaf, Walter Fink, Russell Morris, E. D. Anderson, R. F. McGandy, R. T. LaVake, C. E. Proshek, P. W. Geissler, L. M. Daniel.

Appearing in the costumes of the gay nineties, and singing the songs of that day, the Floradora Sextette was much applauded for their pantomime and song. Mmes. Gilbert Seashore, Karl Anderson, J. P. Heiberg, Ralph Knight, S. J. Cheleen, Leo Fink, were the members of the sextette, and Mrs. D. F. Fitzgerald, the accompanist.

"A German Children's Symphony" assisted the "Low Brow Orchestra" in a group of numbers, and brought much merriment to the guests. This group consisted of Mmes. J. H. Carey, S. H. Schaaf, Carl Waldron, Harvey Nelson, R. H. Creighton, A. N. Bessessen, Jr., and J. F. Curtin, and they were attired in juvenile costumes to the *n*th degree

A group of mixers consisting of Drs. and Mmes. Joel Neal, Frank Hirschfield, and J. H. Simons, added zest to the program.

Mrs. R. M. Pederson, in her characteristic way, entertained us delightfully in Scandinavian dialect.

Personal touches in the form of fake calls on the screen and slides of a few baby pictures brought many a laugh.

Such merriment necessitated police guard and Drs. L. F. Richdorf and Larry Doyle proved most efficient traffic cops.

Community singing led by Dr. LaVake and the crowning of Dr. C. A. Stewart, president of the Hennepin County Medical Society, and Mrs. S. A. Erb, president of the Auxiliary, as king and queen of the Valentine Party, raised their spirits to the highest degree for the Dutch lunch to follow, served by a group of Auxiliary members in valentine garb.

TRANSACTIONS OF THE MINNEAPOLIS SURGICAL SOCIETY

Stated Meeting held December 13, 1933
The President, DR. KENNETH BULKLEY, in the Chair

DUPUYTREN'S CONTRACTURE

A. A. ZIEROLD, M.D.

In 1832 Dupuytren reported a peculiar contracture of the palm which had been noted by a number of other surgeons and which had been commented upon but which had not been satisfactorily explained up to that time. He reported his observations and conclusions, and from that date his name has been attached to this clinical entity. He had the good fortune to have opportunity to dissect the hand of a man who had been killed accidentally and who had had a contracture of the palmar fascia. On the basis of this dissection and his observations at that time, he developed his treatment of the condition. Up to that time, it had been noted, but had been considered an incurable condition, one which, presumably, was related to injury or work involving the palm of the hand.

As you recall, the palmar fascia extends from the annular ligament down to the bases of the fingers, sending a twig medially, particularly on each of the three outer fingers and occasionally splitting, sending one to either side and really forming a contractor of the palm of the hand, should it be contracted. The palmar fascia, of course, can be rendered tense by the tendon of the palmaris longus with which it is continuous.

The condition which bears Dupuytren's name is a peculiar contracture of the palm beginning in the third finger, ordinarily involving the third and fourth fingers and usually involving the fingers of both hands. It is most common in males past forty years of age.

There are a number of observations with a tendency toward the belief that this is a familial condition, occurring in various members of certain families, and there also has been a great deal written regarding its relation to injury. This latter relationship has never been substantiated. We can accept today the fact that when Dupuytren's contracture is once established, injury will call attention to it and may aggravate it, but probably has nothing to do with the initiation of it.

The lesion in itself is a fibrosis of the palmaris fascia. With that progressive fibrosis there is a loss of subcutaneous fat and an increase of the fibrous trabeculæ attaching to the skin. The resulting contracture of the whole fascia flexes the proximal phalanges of the fingers to which it is attached.

The patient whom I have the privilege of presenting to you this evening is thirty-two years old. Twelve years ago, while playing baseball, he noted a burning tenderness in the left hand. On further examination he noted a contracture of the third and fourth fingers. This gradually increased until the fourth finger was pulled down very near to the palm of the hand. The third finger was affected to a lesser degree. Some two or three years later he noted a similar affection of the other hand. The condition persisted and progressed slowly until I saw him two years ago. His family history is entirely negative. There is no one else in his family who has a similar complaint. There is nothing in his personal history of any consequence whatsoever and no other physical disability. The laboratory or clinical findings are of no importance.

Two years ago, I removed the palmaris fascia from the left hand and since that time he has been able to extend the hand completely and there has been no recurrence of the contracture. You will notice that the incision was made at the outer border of the palmaris fascia, and that the skin was reflected, the palmaris fascia dissected out and removed completely. If you will examine the hand closely you will feel a peculiar softness due to the loss of the palmaris fascia. There is still sufficient subcutaneous fat to act as a pad, but there is a definite loss of the normal palmar resistance. The right hand still has the characteristic contracture identified by Dupuytren's name. You will notice the outstanding feature; the attachment of the fibrous fascia to the skin, the curves of the folds of the skin pointing with convexity to the fingers. You will also notice that the contracture involves the proximal phalanx, not the terminal phalanx and that there is no affection of the joints and no involvement of the tendons.

DISCUSSION

DR. WILLIAM PEYTON: About two or three years ago we felt that if x-ray therapy was effective in the condition of keloid, which is excessive scar formation, it might also be effective in the treatment of this condition. In the meantime we have treated two or three cases with apparently favorable results, that is, they have not progressed. None of them have had extensive contracture at the time the treatment was started, but they have not developed more contracture in the meantime and the palpable evidence of this condition in the hand has disappeared to some extent.

Of course, we do not expect to completely obliterate scar tissue which has already formed, but we hope to prevent further scarring and it seems, although it is too early yet to come to any final conclusions, that it does serve that purpose.

I would like to hear Dr. Zierold discuss the differential diagnosis of this condition in regard to xanthoma of the hand.

DR. R. C. WEBB: The question of the relation of trauma to Dupuytren's contracture has been mentioned and in that connection I would like to report a case on which I operated a few years ago. The patient was a lawyer by occupation and there was no history of trauma as a cause of his condition. In addition there was a family history of Dupuytren's contracture, both his mother and a sister having the condition.

DR. J. M. HAYES: I have seen some of these patients treated with x-ray. I was not sure that the treatment had been given by one who had a very wide experience, so that may have accounted for the poor results.

I have seen Dr. Kanavel demonstrate many of these cases on which he had operated and his results were usually very good. No doubt, removal of the palmar fascia is an extensive surgical operation and it would be a great relief to these patients if good results could be obtained by x-ray therapy.

The patient of Dr. Zierold's has obtained a nice result.

DR. GILBERT COTTAM: Free excision of the involved portion of the palmar fascia, as in the case shown, is the only treatment of Dupuytren's contracture which offers complete relief, in my experience. The old multiple subcutaneous division, with splinting in full extension, does no permanent good and should be discarded. I have had no experience with x-ray treatment. We are still in the dark as to the cause, for this lesion occurs as often among those who do not use their hands for heavy work as in laboring people and there is not always a definite history of injury.

DR. A. A. ZIEROLD: Any discussion of Dupuytren's contracture will invariably lead to the effect of injury. So far as I have been able to determine, injury is not

a potent factor. It serves to identify the lesion and, in addition, possibly tends to aggravate it, but probably not to initiate it. The fact that we see these conditions in the hands of those having executive positions quite as often as we do in the hands of those who do manual labor, would tend to corroborate or strengthen the idea that injury is not a vital factor.

I was interested in Dr. Peyton's remarks. I had intended to comment upon xanthoma as it has been my belief that the successful exhibition of x-ray occurred in those cases which were xanthomata rather than Dupuytren's contracture. I do not know from experience nor do I know of anything in the literature which would substantiate the use of x-ray therapy in typical Dupuytren's contracture.

The diagnosis of Dupuytren's contracture, I think, cannot be made beyond any question of a doubt until you have a paired contracture. I believe it is dangerous to make the diagnosis from one hand alone. You can say that the position of the folds of the skin, the loss of the subcutaneous fat, and the obvious contracture of the fascia rather than of the tendons are sufficient criteria to make the diagnosis, but they can be simulated by injury and in the event of a unilateral lesion I would be hesitant to make a diagnosis of Dupuytren's contracture.

REPORT OF THE MEETING OF THE WESTERN SURGICAL ASSOCIATION

R. C. Webb, M.D.

The Western Surgical Association meeting was held in Cincinnati, December 8 and 9, 1933, and the papers presented covered almost the entire field of surgery.

In discussing peripheral nerve transplants where end-to-end approximation of the divided nerve ends cannot be obtained by any of the usual methods, attention was called to the fact that the various methods of bridging the gap have been unsatisfactory. A new method was presented which consisted of taking a few inches of a corresponding nerve from a freshly amputated extremity and inserting it into the gap. The proximal end will grow into the transplanted nerve but when it reaches the distal end of the transplanted nerve sufficient scar tissue will have formed to prevent further growth and a second operation is required in which the barrier is removed and a re-suture of the distal end is performed.

Carcinoma of the breast was discussed and a series of cases presented. There were 26 per cent of five-year cures and 14 per cent of ten-year cures. Excision of the tumor and simple amputation of the breast produced no five-year cures. The radical operation was considered the most efficient weapon. In the discussion, however, one surgeon stated that he had abandoned the radical operation and was merely doing mastectomy.

In surgery of the chest attention was called, by means of a series of cases of pulmonary tuberculosis with upper lobe cavities, to the value of the operative removal of the upper three or four ribs which seemed to obtain greater and more selective compression than any other method. The value of the shortness of the posterior stump of the ribs was emphasized.

Acute empyema was presented as a complication of another disease consisting of an abscess in the pleural cavity which has been adequately walled off and which should be differentiated from an infectious pleurisy which is the early stage and which is not yet walled off. A closed drainage was advocated in infectious pleurisy and open drainage in true empyema. The value of the use of a proteolytic solution and the early removal of the fibrinous exudate was stressed. Also the early removal of the drain as soon as the symptoms have subsided and further progress controlled with x-ray examinations was discussed. Practically the suggestions were, first, to drain by aspiration, second, to follow this with closed drainage when indicated, and third, with open drainage.

In abdominal surgery a gallbladder incision which has been reported from time to time was again shown, consisting of an upper right rectus incision through the anterior rectus sheath with retraction of the rectus muscle laterally and a transverse incision through the posterior sheath. The average time in bed with this incision was four and one-half days.

The appendix received considerable attention as is also proper. A series of cases was presented where the abdomen was explored for atypical symptoms and where appendectomy was the only operation performed. The study five years later showed 69 per cent of cures and eight partial cures. Appendicitis mortality was discussed and the high mortality in the United States as opposed to the low mortality in Europe was presented in the series of three hundred cases presented. The mortality in this series was five per cent but the mortality among the ruptured cases was 16 per cent. The mortality in the cases where cathartics had been used was decidedly increased and the unfortunate part was that in some of these cases the cathartic had been given by physicians. A remarkable series of European statistics was presented where the mortality was but 1 per cent and it was interesting that the administration of gas bacillus serum was a routine procedure in the ruptured cases in this series.

Ileac carcinoid and lymphosarcoma of the cecum with operative cures were presented as a matter of interest. The intraperitoneal hernias through mesentery defects present a rare abdominal condition which must, however, be kept in mind in cases of intestinal obstruction. The discussion on intraperitoneal hernias brought out many similar experiences. Diverticulitis of the various parts of the intestinal tract was presented as a rarity and the mortality in the large bowel cases was presented as 37.5 per cent. The usefulness of cecostomy in diverticulitis of the large bowel was illustrated. A large sarcoma of the duodenum was shown with operative removal and cure but the possibility was suggested that more efficient staining might have shown it to be neuroma.

Bleeding polypoid tumors of the large bowel were presented by means of a series of cases and their tendency to malignant degeneration was shown. Prompt removal of all adenomas and papillomas was advocated.

A rather large series of carcinoma of the penis was presented and the value of the complete operation consisting of removal of the lymph nodes in the inguinal region on both sides as well as the nodes in Scarpa's Triangles with complete removal of the penis and implantation of the urethra in the perineum posterior to the scrotum was illustrated. In a few cases the scrotum and testes were also removed.

Surgery of the kidney was presented in connection with a series of cases conservatively treated by resection. The up-to-date surgeon should not be proud of the number of kidneys removed but rather of the number of kidneys saved or conserved. Fifteen cases of resections of the kidney were shown for solitary cysts, carbuncle of the kidney, double kidney, benign tumors, and other conditions in which the disease process did not include the entire kidney. The value of mattress sutures to control bleeding and occasional fat transplants included in the suture line was presented.

Moving pictures illustrating resection of the right colon for carcinoma were shown. A method of anastomosing the end of the lower ileum to the side of the transverse colon in an aseptic manner, using the special clamp, was beautifully illustrated.

The repair of inoperable inguinal hernias by the use of a large sheet of fascia lata which had been left attached at its upper end and was shifted subcutaneously to the region of the defect, was illustrated by

a beautiful series of slides and a small series of successful cases was shown.

Fractures and their status in the field of surgery was the subject of the presidential address. Many well known facts were reviewed and it was lamented that oftentimes a Boy Scout could give instruction to our junior internes.

Fractures of the elbow were discussed as serious cases which demand early reduction and a series of severe fractures of the elbow with very satisfactory results was presented in detail.

DISCUSSION

DR. THEODORE H. SWEETSER: I wish to use Dr. Webb's remarks regarding the mortality of appendicitis as an excuse for a warning that amebic dysentery must be kept in mind especially at this time. In my work for the State Medical Association I was asked last week by the State Department of Health to listen to a discussion of proposed public health measures for the control of amebic dysentery.

I wish to emphasize just one fact which was brought out only incidentally. It was noted that the general mortality of all cases in the present outbreak has apparently been under 10 per cent, but that, among the patients who have undergone operation, most of them for supposed acute appendicitis, the mortality has been 80 per cent. That is a startling comment, the list including many prominent names. I recognize that delay in the treatment of acute appendicitis is often most unwise, and that the laboratory diagnosis of amebic dysentery is sometimes difficult and time consuming, but I wish to ask that we all keep amebic dysentery very sharply in mind in the differential diagnosis of abdominal disturbances, especially suspected acute appendicitis.

THE DIAGNOSIS OF KNEE JOINT INJURIES

INAUGURAL THESIS

HARVEY NELSON, M.D.

Considerable time is spent in our schools in emphasizing a methodical history taking to elicit characteristic symptoms, and in developing a routine technic of physical examination of inspection, palpation, percussion and auscultation of hearts and chests, of inspection, percussion and palpation of the abdomen; but little, if anything, is done to develop a routine method of examination of just as common conditions as back and joint injuries. It is, therefore, the express purpose of this paper to emphasize a routine procedure of examination in knee joints and outline in as much detail as time allows the most frequent type of injuries that should be commonly looked for. It is only by careful application of the principles of a methodical examination that we, as individuals, can expect to establish a definite diagnosis. We would be laughed at if we would hide behind a diagnosis of an abdominal colic or old-fashioned cholera morbus and still how many of us have merely looked at a swollen knee, called it a sprain and advised the patient to apply heat and an elastic support.

Anatomy of the Knee Joint.—A brief understanding of the mechanical and anatomical structure of the knee joint is essential and is easy to assimilate.

The knee joint is the largest joint in the body and being superficial as well as dependent for its strength on its soft tissue structure, is easily susceptible to injury. It is in reality a double joint or two separate joints with a full set of component ligaments with the whole functioning roughly as a hinge. We have the femur above with its internal and external tuberosities of the tibia below. The joint spaces of the tibia are deepened by the two semilunar cartilages—the internal and external. The two joint spaces are separated in the mid-line by the tibial spines to which are attached the crucial ligaments which stabilize the knee joint from front to back. Stabilizing the joint from side to side are the internal lateral and the external lateral ligaments. The internal lateral ligament, located on the inner side, extends from the mesial aspect of the internal condyle of the femur to the posterior mesial aspect of the inner tuberosity of the tibia. This internal lateral ligament is attached in its descent to the internal semilunar cartilage, especially in the posterior portion, a fact of considerable importance as it is a cause for the detachment of this cartilage. The external lateral ligament, with a short and long portion, extends from the external condyle of the femur postero-laterally to the head of the fibula. The tendon of the popliteus muscle lies between the external lateral ligament and the tibia separating the external lateral ligament from the external semilunar cartilage, another fact of considerable importance as it is a reason for the relative infrequent detachment of the external semilunar cartilage. Anteriorly, the patellar tendon, patella and the quadriceps tendon act as the anterior stablizing ligament. Posteriorly, the capsule is somewhat thickened, forming the posterior ligament. In addition to this, the joint capsule is, of course, complete throughout but of less clinical significance than the above special areas of reinforcement. The patella slides up and down on a special anterior articular surface of the femur in which nature has made the lateral condylar portion more prominent than the internal to prevent lateral dislocation of the patella.

About the knee joint are a number of bursæ which are of clinical interest and which may communicate with the joint. The most important of these are the prepatellar, suprapatellar and infrapatellar anteriorly and some seven or eight bursæ posteriorly, all of which are in relationship to the tendons in this region. The most important of these latter is located under the internal head of the gastrocnemius tendon. A brief résumé of the synovial membrane completes a working knowledge of the important anatomical structure of the knee joint from a clinical standpoint. The synovial membrane lines the joint throughout its superior, anterior and posterior compartments and has the capacity of forming the synovial fluid.

Routine Examination of the Knee Joint.—What sort of routine procedure should we follow in examining the knee? I do not believe it is sufficient in the history to merely acquire the information that a knee joint has been hurt. Certainly if an internal lateral ligament might be torn by a sudden inward bending, or an internal cartilage detached by a sudden inward twist or torsion of the femur on a fixed tibia, it is important to obtain this history. A history of a fall or a direct blow to the knee joint might suggest a fracture of the patella or the upper portion of the tibia and do not forget that many a patient has walked into the office on a fracture of the condyles of the tibia. The type of strain or injury should immediately suggest the possible damage that has been done. The conduct of the patient following the injury should also suggest the severity and in some respects the type of injury sustained. If the leg is weak it is important to know in which direction the knee tends to give way. In detached semilunar cartilages, the history is especially of vital importance.

I believe that the procedure of the examination proper can be divided into inspection, palpation, testing of motion, taking of measurements and finally such laboratory studies as x-ray and aspiration.

An excellent practice to follow is to always expose both knees. Localized and even generalized swelling can only be always determined by direct comparison with the opposite normal joint. One training that the estimation of industrial disabilities does accomplish is the constant utilization of the opposite uninjured mem-

ber as a basis for the normal of any specific member. The patient should thus sit before the examiner and both knees should thus be inspected in both the flexed and extended positions for any swelling or irregularity.

A good method of palpation is to use a thumb on each knee. Any irregularity can be felt and compared. Any tenderness should be accurately located. The tenderness of an injured lateral ligament is located to the lateral or medial side of the knee and most frequently over the attachment of the ligament above or below the joint space. Here, too, the knee should be palpated in both the flexed and extended positions. I have frequently been able to determine tenderness over the internal semilunar cartilage with the knee flexed where in the extended position, the tenderness was indefinite. If so indicated, the bursæ should be palpated and the presence of chronic thickening or loose bodies in the prepatellar bursa noted if a bursitis is present. If there is any question of a loose cartilage or a loose joint body, this should be patiently felt for. The palpation of a loose body in the joint space on one occasion is ample reward for repeated fruitless manipulation of the joint. Finally, the presence or absence of crepitus should be noted and the common crepitus of the patella or prepatellar bursa is not to be confused with a true crepitus of the knee joint. As a general rule, a harsh grating crepitus in the joint indicates a synovial involvement whereas a clicking crepitus inidcates a bony involvement or possibly a loose cartilage. Moorhead suggests the use of the stethoscope as an adjunct in this step.

Under the heading of "testing of motion" is included both the determination of the normal joint movement of flexion and extension and also the lateral and crucial ligament mobility. In testing out the range of motion, we have made a practice of recording accurately the range in degrees in each knee. This gives a permanent and accurate record which cannot be obtained otherwise. Increased lateral mobility is tested for both with the knee slightly flexed and with it in the relaxed extended position. Here, to, a careful comparison of the two sides is of vital importance. We have found that an easy way of determining this is by having the patient in a sitting position with the leg supported horizontally by one of the examiner's hands holding the back of the knee and the other grasping the leg. With the surgeon in the standing position first on the outer and then on the inner side of the knee, the examiner can brace his own knee against his hand supporting the knee, test the mobility first of the internal lateral and then of the external lateral ligament, with the patient's knee braced against his own. The advantage of this method is that the procedure is steadier and I find that it is often difficult, especially in large patients, to steady and control the patient's knee with the hand alone. In cases of strain of the lateral ligament without relaxation, this testing of the lateral mobility will cause pain but only when the stress is placed on the injured ligament and only in the region of the ligament or its attachments. Increased crucial ligament mobility can be determined both with the knee flexed and extended. With the patient in a sitting position and the foot resting on the floor, the lower femur is steadied with the left hand and the upper tibia firmly grasped with the right hand and worked back and forth. When the knee is extended, it can also be steadied with the left hand while the right hand, grasping the lower leg, forcefully pulls forward and back in the manner of opening and closing a drawer. In chronic joint effusions, more or less relaxation of all the ligaments will frequently be found.

The taking of measurements graphically pictures certain conditions that are present. In this age in which industrial surgery cannot be entirely separated from general surgery, it also gives us a valuable permanent record of the degree of swelling or atrophy and the range of function that is present. The circumference of the thigh at a fixed point, the circumference of the knee, the calf and lower leg give the complete picture. Checking the range of movement is a simple procedure which requires only the use of a carpenter's angle rule which can be secured in any hardware store. The fixed points are laterally the greater trochanter of the femur, the lateral condyle of the femur and the lateral malleolus of the tibia. In the anterior view the fixed points are the anterior superior spine of the ilium, the middle of the patella and the great toe.

I believe that the only subjects from the laboratory that need to be mentioned here are first, aspiration and, secondly, the x-ray. The use of aspiration for diagnostic as well as therapeutic purposes is too frequently neglected. Early aspiration of fluid where the knee joint is distended, repeated if necessary, and followed by the application of a firm compression handage is of definite therapeutic value. The frequent finding of hemorrhagic or sero-hemorrhagic fluid is practically diagnostic of a traumatic synovitis in the absence of a fracture into the joint. If such a procedure is done under aseptic technique with the needle entering the joint lateral to the mid position of the patella and directed upward and medially underneath the patella into the superior compartment above the central portion of the patella, there are no important structures to be injured.

With regard to x-rays, suffice it to say that any injury to the knee important enough to require a definite diagnosis is important enough to require x-rays to rule out a fracture. Often an angle plate will be helpful, especially where loose bodies are suspected.

Common Injuries to the Knee Joint.—As we have previously stated, it is not possible to discuss with any detail the numerous possible injuries to a knee joint. In order to properly execute an examination of a knee joint, however, it is necessary to be familiar with the signs and symptoms of the common injuries that might occur. In concluding, therefore, I will discuss briefly: (1) synovitis and the ordinary sprains; (2) injuries to the lateral and crucial ligaments; (3) internal derangements of the knee joint, especially of the semilunar cartilages, and finally (4) fractures.

The term synovitis has come to be used rather carelessly but is usually meant to infer a sprain or a contusion-sprain. It would be well to remember that the effusion that accompanies a synovitis may be merely a symptom which should, in itself, not be accepted as a satisfactory diagnosis until all other accompanying more serious injuries have been ruled out. Unlike a synovitis in the ankle, for example, a sprain of the knee may be complicated by a derangement of the intra-articular structures, as for example, an internal semilunar cartilage or the lateral or crucial ligaments. In the history of a sprain of the knee, we may have a direct blow to the knee or more often, a torsion or inward bending of the knee which may or may not be accompanied by a direct blow. In these cases, we find an effusion of the joint, which causes the patella to be "floating" in the more severe cases. A typical synovitis due to trauma, I believe, forms a fluid which is more often hemoserous than purely serous.

Aside from the simple sprain or so-called synovitis, I believe that the most common injury that is encountered is the injury to the lateral ligament, particularly the internal lateral ligament. Rupture of the internal lateral ligament is caused by an over-abduction of the leg which may or may not be accompanied by a certain amount of torsion. Obviously, rupture of the external lateral ligament is caused by the opposite force in which there is an over-adduction which may or may not be accompanied by torsion. The same mechanism which might rupture the internal or external lateral ligament might also cause a detachment or derangement of the cartilages. After the acute injury, there is pain, increased intra-articular fluid, possibly ecchymosis and most certainly some swelling with tenderness over the

injured ligament, particularly at its attachment. The clinical findings may vary from a mere pain upon putting strain upon the injured ligament to a complete rupture of the ligament in which there is very little if any restraint through abduction or adduction of the knee. External rotation may be increased when there is a relaxation of the internal ligament and internal rotation may be increased when there is a relaxation of the external ligament accompanying the increased abduction and adduction. The patient practically always has a feeling of instability and weakness in the injured knee joint.

In the case of the crucial ligament, the anterior crucial ligament can be injured by the same force which causes derangement of the internal cartilage and the posterior by the same mechanism that causes damage to the external cartilage. Extreme torsion may also rupture the crucial ligaments and fractures are occasionally accompanied by rupture of the crucials, with or without an accompanying fracture of the tibial spine. This injury is determined by an increase of the forward and backward play in the knee joint in which a ruptured anterior crucial ligament allows an increase of the forward gliding of the tibia with hyperextension of the knee joint. If the posterior ligament is ruptured, backward gliding of the tibia is increased. In these cases, it might be possible to elicit a tenderness over the tibial spine anteriorly when the knee is flexed on pressing just medial to the patellar tendon. When the posterior ligament is involved, there may be tenderness just below and internal to the lower portion of the patella with the knee joint flexed. The later symptoms of crucial ligament injuries are instability of the knee joint in which the patient describes a tendency for the knee to give way forward. In these cases too, there is a tendency toward hyperextension on occasions.

We have already discussed to some extent the mechanism of injury to the internal and external semilunar cartilages and have already stated that the detachment of the internal semilunar cartilage is much more frequent than in the external. In the case of the internal semilunar cartilages, the detachment is usually brought about by an inward twist and torsion of the femur upon the fixed tibia often associated with an abduction of the leg. The mechanism of injury is obviously much similar to the mechanism of injury to the lateral ligament. The pain is usually sudden, intense and located over the region of the cartilage which has been detached. With this, the joint is locked and cannot be extended until the cartilage replaces itself. In some knees that are untreated, limited extension may persist for a considerable period of time. The locking and limited extension are accompanied by increased fluid in the knee, subsequent swelling and pain with tenderness over the local area of the cartilage. Repeated lockings are the common history and in time, the patient himself learns to manipulate the knee until the displacement corrects itself. The history of locking followed by swelling and subsequent soreness, the finding of localized tenderness over the cartilage and the palpation of a movable cartilage on manipulation of the knee are diagnostic signs and symptoms.

Time only permits a brief resume of the various fractures which may occur in the region of the knee joint. The majority of fractures in this area are accompanied by severe trauma so that the presence of a fracture in itself is apparent. These fractures, therefore, do not come entirely within the scope of this paper in which it is our primary intention to outline a routine procedure of examination of the knee joint. Aside from the fractures that have already been mentioned, as for example of the tibial spine, the most common fracture in the region of the knee joint is that of the patella, with second in frequency, fractures of the plateau of the tibia. In both of these areas, it is not uncommon for fractures to be overlooked where such fractures do not involve the bone in its entirety. It is the duty of the attending physician to x-ray all injured knee joints which are accompanied by objective findings of trauma, as it is only in this way that fractures can be entirely ruled out. Considerable damage might be done to a patella or quadriceps tendon by the patient walking around with a patellar fracture, to the extent that an operative repair might be necessary whereas previously the treatment would be simple and conservative. The same is true of fractures of the condyles of the tibia where a downward displacement of the fractured condyle from weight-bearing might result in a definite and lasting instability of the knee joint with resulting permanent disability. Fractures of the lower end of the femur in the region of the knee joint I believe are comparatively rare and except in certain types of injury, would not, as a rule, involve the knee joint proper. Dislocations of the patella and the knee joint are also obvious injuries that are apparent on simple inspection.

The facts contained in this paper are, while rudimentary in character, given for the sake of simplifying and combining together various facts that we all know and should carry with us as a unit whenever a knee joint injury is encountered. The examination of the knee joint should be a methodical and pleasurable task. Accurate diagnosis can usually be made with a little care.

DISCUSSION

DR. R. F. MCGANDY: I think this has been a well presented paper and as most of us will agree, a timely one. The part of this paper which impressed me the most is the fact that examination of the knee joint has proceeded through definite stages. I think this fact has never been sufficiently stressed in school. We were taught how to carefully, in a routine way, examine a chest or heart but knee examinations were not brought out in the same light. It is only through a careful examination as Dr. Nelson has outlined that we can come to a definite conclusion as to the nature of a joint injury. This not only applies to knees but also to other joints such as the back. In this latter respect I have in mind an outline for the examination of lower back injuries which a member of this Society has recently compiled for use in railroad work. I feel that with some modifications this could be made to apply to knee joints and similar conditions.

DR. LEO MURPHY: I have enjoyed Dr. Nelson's excellent presentation. Since my attention has recently been called to the rather specific beneficial effect of x-ray therapy in cases of acute bursitis I am prompted to ask Dr. Nelson whether or not he has employed it, and with what results, in bursitis about the knee.

DR. J. M. HAYES: Dr. Murphy has mentioned the therapy of bursitis of the knee joint, and Dr. Ude's work. I am much interested in this since I happened to be one of his first victims of a painful bursitis.

I had charge of the physiotherapy department for the Veterans' Bureau from 1921 to 1926. During that time we treated many of these cases. We sometimes see diathermy used for treatment of almost every pathological condition. We found that diathermy gave very definite results in bursitis due to trauma, but usually not in those due to infection. Personally, I have not found anything that relieves the pain of acute infectious bursitis, as does x-ray therapy.

DR. E. A. REGNIER: I enjoyed the essayist's paper very much. The points brought out relative to the manner of arriving at a diagnosis are important.

I would have liked to have had Dr. Nelson elucidate further on certain diagnostic procedures about the knee joint. One thing, which has been obscure and where we have had no help from radiologists and where several consultants have frequently differed, as to whether you did or did not have ruptured crucial ligaments. There seemed to be no method we have at hand, except an operation, to prove that we have a ruptured crucial ligament, unless you can definitely demonstrate

the fracture of one of the tibial spines. Undoubtedly many such fractures are overlooked or obscured by adjacent fractures.

I would like to have Dr. Nelson speak further on that subject if he has any further information for us.

Dr. R. C. Webb: I have seen a good many knee injuries involving the semilunar cartilages in which the characteristic locking was absent. It is easy to diagnose an injury to the internal semilunar cartilage if the knee is locked and the x-ray does not show some other reason for the locking. When, however, the case does not exhibit the classical locking and is brought to a surgeon at some time after injury one dislikes to open the knee joint for an extensive exploration. In this connection I would like to emphasize the value of an exceedingly careful history and description of the manner in which the injury was received. When a man injures his knee joint in the classical manner which produces a cartilage injury and the complaints continue, the burden of proof rests on the person who states that the semilunar cartilage is not injured.

There is another point of interest to me and that is when one should operate on these cartilage injuries which are not locked. There is also a possibility that the patients may recover without operation when the injury is confined to the ligamentous attachments of the cartilage. In this connection, I would like to report the reactions of two patients who had injured the semilunar cartilages in one knee and five years later injured the semilunar cartilage in the other knee. These men were young, strong, well developed car inspectors who worked together. One of them had been under a car inspecting with his leg flexed and stretched backward when, for some reason, he suddenly decided to move from his position and injured his knee. I treated him for approximately six weeks and then operated upon him, removing a split internal semilunar cartilage, and in the course of a few weeks more he returned to work. His partner injured his knee in the same manner a few weeks later and I treated him and he was able to return to work in the course of a few weeks but his knee continued to bother him for two years. Five years later these same two patients, who had continued in the same occupation, injured the opposite knees, a few weeks apart. They had had five years in which to compare notes upon their two methods of treatment and the joint of interest was that upon receiving the same injury to the opposite knee they both demanded immediate operation. These two cases have interested me because they were two intelligent men and had had ample opportunity to judge the radical and conservative methods of treatment of injury to the internal semilunar cartilages.

Dr. Harvey Nelson: It has been my experience in the usual acute bursitis, that aspiration of the fluid and application of compression bandages usually causes the condition to clear up in a few days or a week or two. In the chronic or infectious bursitis, the x-ray might be of considerable value.

In answer to Dr. Regnier, regarding the crucial ligament, I still feel that a certain amount of relaxation in the crucial ligament could be determined by careful manipulation of the knee joint. The question which arises in my mind is that sometimes the injury to the crucial ligament is quite severe and the amount of play is relatively slight. I recall a case operated on for a cartilage about a year ago and the anterior crucial ligament was almost destroyed. It seems that the symptoms would have been marked but they were slight.

I cannot answer Dr. Bulkley's question as to the percentage of frequency of the fracture of the tibial spine in injuries to the crucial ligaments. I think an injury can occur to the crucial ligament and does occur quite frequently, without a fracture of the tibial spine just as it does to the internal and external ligament.

Dr. Webb's points are well taken. Obviously, injuries to the semilunar cartilage do not always follow the typical picture. I have been inclined to take the viewpoint, possibly I am wrong in so doing, that exploration of the knee is a procedure which should be done as exploration of the abdomen in certain cases. We recently had a case in which the man gave no history of locking, gave a history of his knee bothering him and feeling tender, the tenderness was located definitely under the internal semilunar cartilage and on two occasions I was able to feel a cartilage fragment in the internal joint space. The cartilage, at operation, was found to be split longitudinally and the medial fragment was completely in the joint space. It had been walked on and was completely frayed out. I think, rather than to encounter a condition of that kind in which permanent damage is done to the articular cartilage, it would be better to explore the knee joint.

I recently had occasion to examine a case which brought up a rather important fact regarding disability which I wish some of you men would comment on. A man detached his semilunar cartilage with a definite history. There was no question of the diagnosis. In the Fall of that same year it again locked and on each occasion he was laid up for six weeks or two months. Subsequent to this he had no trouble for about four months. Then, while working for a different employer, and with a different insurance company involved, the cartilage again locked and he was disabled for approximately eight weeks. He continued to work until January of that year when a fourth locking occurred with a subsequent disability and finally, in September, another locking occurred from which he is still disabled. I believe he has gone back to work but he has symptoms. On each occasion, a different insurance company was involved and there is a question as to who is going to pay the bill for the operation, whether the first insurer is to blame because of the first injury, whether the last employer is to blame because of the aggravation of the symptoms, or are the intermediate insurers to blame?

F. A. Olson, M.D., *Secretary.*

BOOK REVIEWS

Books listed here become the property of the Ramsey and Hennepin County Medical libraries when reviewed. Members, however, are urged to write reviews of any or every recent book which may be of inetrest to physicians.

BOOKS RECEIVED FOR REVIEW

Nature, M.D. Healing Forces of Heat, Water, Light, Electricity and Exercise. Richard Kovacs, M.D. 181 pages. Illus. Price, cloth, $2.00. New York: D. Appleton-Century Co., 1934.

San Francisco Cancer Survey. Eighth Preliminary Report. Frederick L. Hoffman, LL.D. 314 pages. Illus. 1933.

Pyelographie. Docteur Marc Imbert. 193 pages. Illus. Price, paper, 35 fr. Algiers: Imprimerie Jules Carbonel, 1933.